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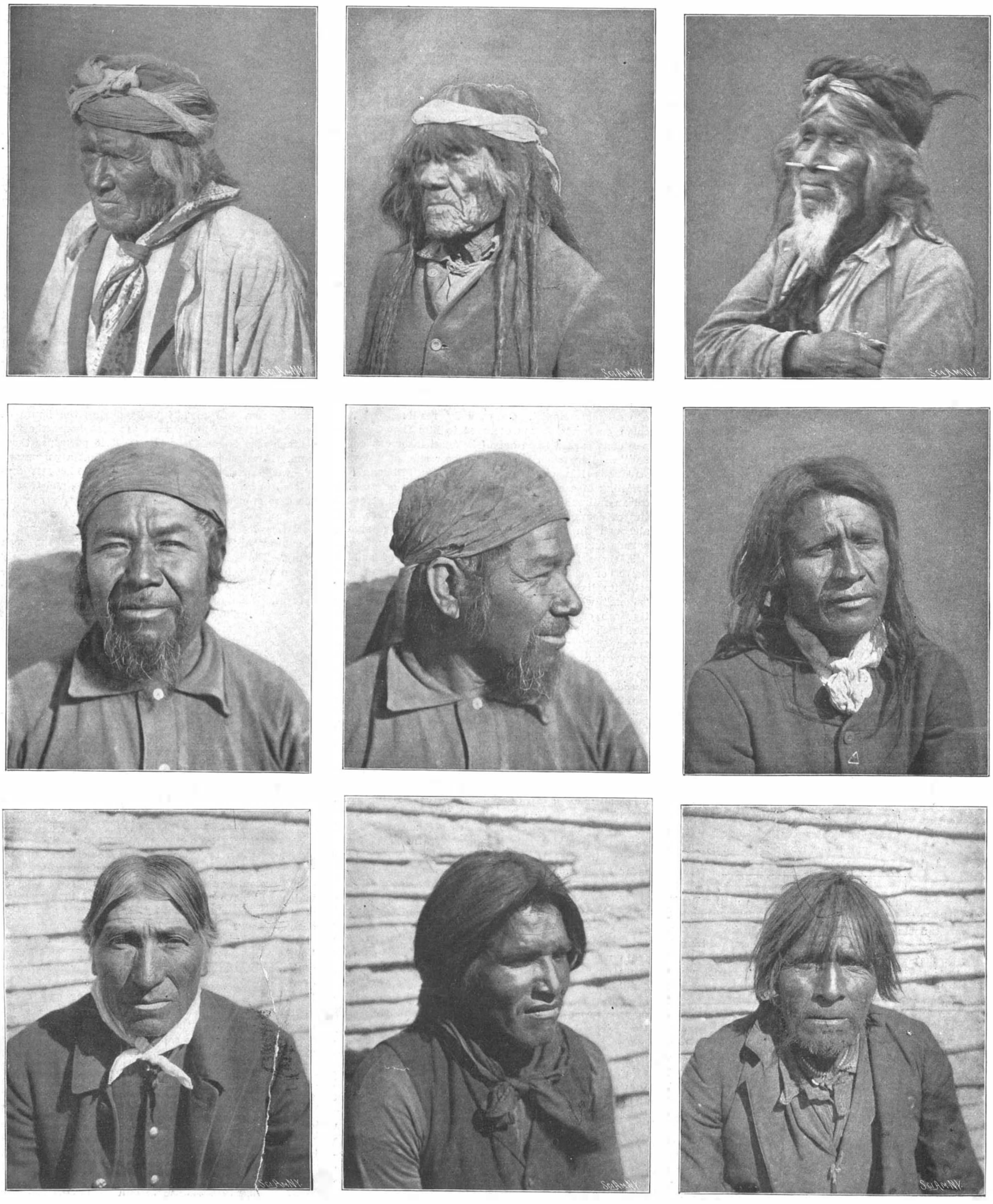

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SOME TYPES OF MOHAVE AND YUMA INDIAN PHYSIOGNOMIES.—[See page 58.]

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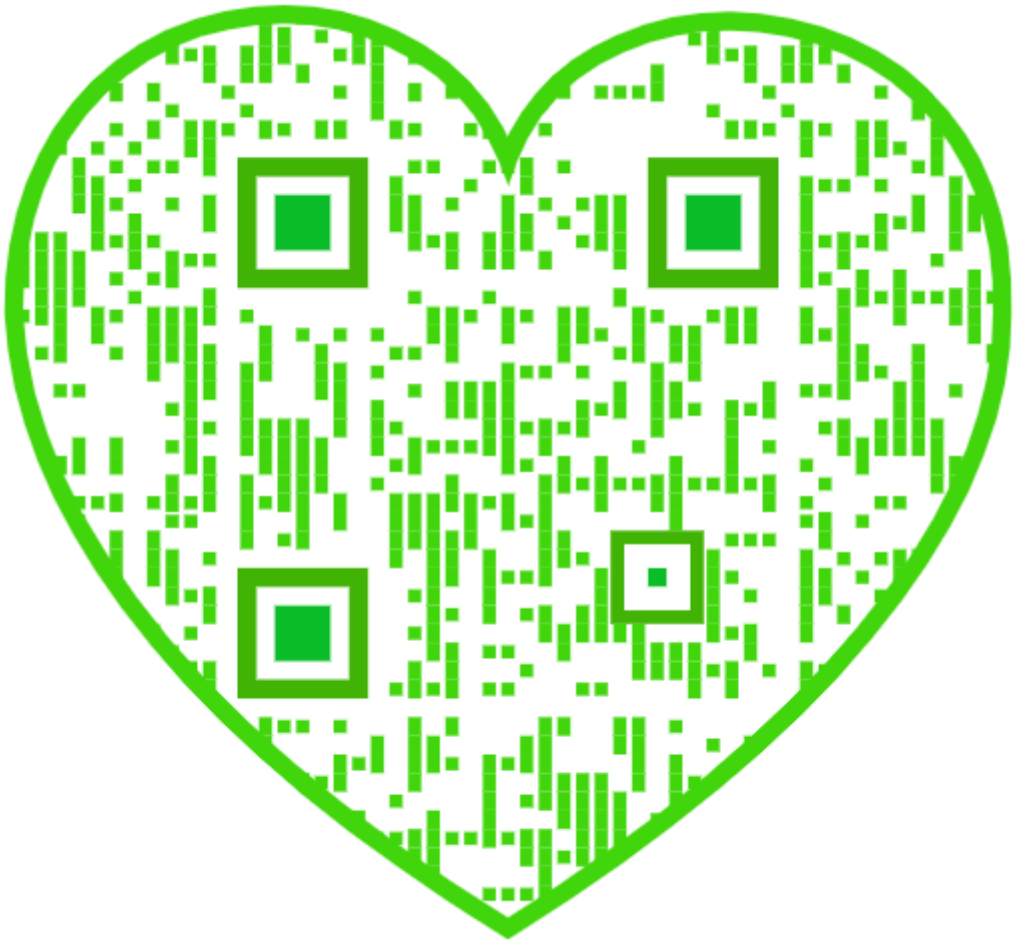

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NEW YORK, SATURDAY, JANUARY 24, 1903.

The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

WIRELESS TELEGRAPHY AND THE "ST. LOUIS."

The painful uncertainty attending the belated "St. Louis," of which nothing was heard, from the time she left Cherbourg until she was sighted at Nantucket, a week overdue, suggests that for passenger ships at least, the time will be welcomed when every vessel is equipped with a wireless telegraph outfit. Although none of the vessels so equipped would be capable of repeating Marconi's feat when he communicated from one of the vessels of the American Line over 1,500 miles at sea with the powerful Poldhu station, a range of say 200 miles should be quite within commercial practicability. Considering the crowded condition of the various steamship lanes across the Atlantic, it would be impossible, were all passenger ships so provided, for a vessel to remain unspoken for more than a day or two at the longest; and a liner disabled in mid-Atlantic should be able to communicate from ship to ship with her home port and news of her trouble be made known, long before the day set for her arrival. In this way an enormous amount of anxiety could be spared to relatives and friends on the all-too-frequent occasions when transatlantic vessels are disabled. Indeed, we consider that just as soon as wireless telegraphy has been placed on a thorough commercial basis, it would be quite within reason for a law to be passed requiring all ships to install some one of the wireless telegraph systems which will be on the market.

MAGNITUDE OF COMMERCE ON THE LAKES.

The close of November on the Great Lakes usually marks the end of the season of through navigation; and the government statistics show that for the first eleven months of the past year 77,408 vessels, of over seventy-one millions net tonnage, were reported as arrivals, and 77,899 clearances were reported, of over seventy-two million net tons. There are twenty individual ports on the Great Lakes having a registered tonnage ranging from one million to over five million tons. Cleveland heads the list with 5,037,282 tons; and five other ports, viz., Duluth, West Superior, Milwaukee, Chicago and Buffalo, recorded over four million tons of arrivals. The enormous volume of this movement is only appreciated when it is compared with similar marine operations on the ocean frontage. New York, during the entire year 1902, is credited with 8,982,767 tons of arrivals; London had entrances in 1901 amounting to 9,992,753 tons; and Hong Kong reported 8,626,614 tons entering in the year 1900.

NEW METHODS OF TUNNELING.

It was inevitable that the construction of the Rapid Transit East River tunnel, and the North and East Rivers tunnels of the Pennsylvania Road, should stimulate inventors to devise new and better means of tunneling through silt or other soft material. All the later methods that have been outlined make provision for supporting the weight of the tunnel upon the firm rock bottom underlying the silt. The Chief Engineer of the North River tunnel, Mr. Jacobs, does this by opening the bottom of the tube at stated intervals, and carrying a concrete-filled cylinder pier down to bedrock, the weight of the tube and the trains being carried by two parallel trusses resting upon the piers, and constructed within and on each side of the tube itself.

Another system, which has recently been patented by Mr. Sooysmith, employs the freezing process associated with timber piling. When tunneling by this method, a pile foundation is first driven from the river surface throughout the whole length of the tunnel; the material lying just above the piling is then frozen by driving a small pilot tunnel ahead into the surrounding material; and the tunnel is excavated through the material thus frozen, the steel tube resting upon the pile foundation that has been driven for it.

Yet another method is that of Mr. Reno, who drives the tube by the usual pneumatic shield method, and, as it proceeds, takes out a bottom section of the tunnel lining, excavates a rectangular chamber below the tunnel and fills it with a mass of concrete, thus placing the tunnel tube upon a continuous, deep, concrete bed of sufficient weight to prevent vertical or lateral displacement. The great magnitude of the present tunnel schemes, and the importance of securing the system which will be easiest of construction and most secure against deformation when built, render this problem one of the most important that has come up in the world of civil engineering for many years past.

A DOZEN NEW VESSELS FOR THE SHIPPING TRUST.

It will be remembered that when the great steamship merger known as the International Mercantile Marine Company was publicly announced, it was stated that there would be a division of all new steamship construction between American and British yards. The company has just authorized the statement that no less than a dozen Atlantic liners are to be added to their fleets. Of these vessels six will be launched in this country, three of them from the Sparrow's Point yards, Baltimore, and three at the Camden yards, Philadelphia, while the other six will be constructed in British yards. All of these vessels are to be of the mixed freight-and-passenger type which has proved so popular in the "Celtic," although none of the ships will be as large as the latter vessel. Their tonnage will run from 12,000 to 16,000 tons, and the length from about 500 to something over 600 feet. It is significant that not one of these vessels is to be of the high-speed type, the average sea speed varying from 14 to 16 knots. It is well understood that the slower vessels with large cargo-carrying capacity are the most profitable ships afloat, and that their net earning capacity increases rapidly with increasing size.

THE HUMORS OF RAILROADING.

In a recent issue, the Editor, in describing a ride on the locomotive of the Twentieth Century Limited, over the New York Central and Lake Shore Roads, ventured, with many misgivings, to attempt the role of an impressionist. On casually reading over the cold-type result, it has occurred to him that the "impressions" are a little out of balance, inasmuch as he has failed to touch upon the lighter side of the very strenuous life on the footplate; for although the handling of a crack, modern express train on an American railroad is a task calling for the highest qualities of courage, judgment, and eternal vigilance, and although in the background of changing sights, sounds and scenes that go to make up the engineer's life, there is always visible the specter of sudden death or shocking injury, life on the road has still its lighter and humorous phases. One of the "sights" which the privileged guest in the locomotive cab of an express train will be told to watch for, is the taking of water from the trough tanks between the tracks. It is an interesting and even a spectacular sight, particularly if the scoop should be left down a little too long, and the tank should overflow. On the occasion of our ride, when we were making fast time over a stretch of the magnificently-kept roadbed and track of the Lake Shore system, we took water at a trough while we were running at considerably above the regulation speed of 45 miles an hour, to which enginemen, as a rule, are expected to slow down. Now, when a forwardly-projecting scoop is pushed through standing water at a speed of 60 miles an hour, it can be understood that the inrush of water to the tank is in such a volume as to fill it up in an exceedingly short space of time, and hence it requires considerable judgment on the part of the fireman to raise the scoop at the "psychological moment" and avoid an overflow. To provide against rupturing the tank there is a large, square hole cut in the top of the tank at its rear, just opposite the baggage car front platform; and in case of an overflow the water boils out through this opening in a perfect cataract. When the Twentieth Century train was first run over the road, it happened that the tank was overfilled, and the water, rushing out, fell against the front end of the baggage car, burst open the door, rushed through the baggage compartment, poured into the barber's shop, and so scared the tonsorial artist that he stood not on the order of his going, but fled headlong into the smoking compartment, with the foaming flood at his heels. Thereafter, to provide against another accident of the kind, the front door of the baggage car was battened; and the baggage master and barber henceforth pursued their respective callings, dry shod.

The scoop is lifted from the tank by means of an air cylinder. On the occasion when we made the run, the "air failed to act" (at least so said the fireman), with the result that the water continued to rush into the tank long after it was filled, and the writer witnessed a display that was simply magnificent. Tons of water as it boiled over, fell against the front end of the baggage car, and, dividing, rolled off in a splendid cataract at each side of the track. Here, as it struck the gravel ballast, at a velocity of a mile a minute, it acted like water from the nozzle of a gigantic fire hose, and the flying waters spread right and left in a huge cloud of foam and spray that entirely hid the following train from view.

Now, it so happened that once upon a time, subsequent to the closing up of the front door of the baggage car for the reasons above stated, a certain tramp, seeing an opportunity for an unmolested 160-mile ride on one of the fastest trains in the world, stole up on the front platform as the train was starting, and coiled up for the trip. There are two water troughs on this run, at each of which the scoop is used; and whether it was that the firemen accidentally caught sight of the "deadhead," history saith not; but it is a fact that by a curious coincidence, at each trough in succession there was an overflow of the most violent character. At the end of the run, when the engineer was looking over his engine, he was confronted by what he described as the most absolutely washed-out specimen of humanity that he had ever seen, who with the water still in the act of draining itself out of his hair and tattered clothing, placed his hand on the arm of the engineer, with the query: "Say, mister, what was the names of them two rivers we run through back there?"

SUBWAY VENTILATION.

In the present rapid extension of subways and deep tunnels there is a danger of neglecting the all-important question of ventilation. Even in cases where the question has been considered, the means taken to provide for a constant supply of pure air have been more or less inadequate. Recent tests of air taken from the London tubes at various hours of the day, prove that it becomes vitiated to a degree that is a positive menace to the health of the public. It was found that while samples of air taken at street level outside the stations of the Central London Railway contained an average of 2.83 parts of carbon dioxide per 10,000, tests of air taken at the same time from the interior of the stations, and from the cars within the tubes, showed that on the station platforms the percentage varied from 4.23 to 7.36 parts during the hours of moderate traffic, while during the rush hours the percentage rose from 11.04 parts to 20.46 parts per thousand. Now, when we bear in mind that a percentage of over 6 parts of carbon dioxide in 10,000 is considered to be, to say the least, undesirable, and that in the case of persons of weak constitution this percentage becomes positively harmful, we can understand how very injurious the atmosphere in crowded cars in a subway or tunnel must become, during the rush hours. The SCIENTIFIC AMERICAN has frequently drawn attention to this most important aspect of subway and tunnel construction; and now that the Pennsylvania Road has been granted a franchise for its deep-level tunnels, and the East River and North River tunnels are under construction, the question becomes one of most vital interest to the New York traveling public. We believe that, at present, the subway engineers are trusting to the movement of the trains to produce sufficient ventilation; and, if so, it looks as though they are confusing ventilation and circulation. The movement of trains will produce circulation; but if the air be already vitiated, it will require something more than the mere transfer of the air by the piston-like action of the trains to render it pure. Provision must be made for taking into the tunnels a supply of fresh air and expelling that which has been vitiated, and to secure the best results this action should be constant and not intermittent.

COLONISTS FOR OUR NEW PUBLIC LANDS.

The adoption by Congress of a homestead law for our new insular or colonial possessions will throw open to colonists a new princely domain beyond the seas which will have attractions for tens of thousands of settlers, who will undoubtedly emigrate as soon as adequate laws are enacted to protect them in their rights. The rush for the new homesteads in the Philippine Islands, Porto Rico, Hawaii, Tutuila, and Guam will present one of the most spectacular movements of American population, and will inaugurate an era in our development of lands beyond our own continental border unprecedented in history. The exact effect of this upon the industrial development and expansion of our new colonial possessions can easily be predicted, for similar opening and settlement of public lands have always been attended by rapid growth and improvement of the natural resources of the country.

The public lands in these new islands represent some of the richest and most fertile soils found anywhere in the world, with agricultural, mining, and timber resources scarcely comprehended even by our experts. For centuries these great possibilities for material wealth have remained undeveloped, and they must continue so under the control of the people who have always failed to appreciate their opportunities. Under Spanish rule there was little opportunity for ambitious

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colonists to take possession of the lands and develop them, and even had their rights and property possessions been respected and encouraged by the authorities, the warlike condition of the native population would have made their wealth somewhat precarious. It was only along the coast and on the outskirts of the few large towns and cities that anything like civilized settlement of the Philippines was undertaken. With the restoration of peace, and adequate laws to protect settlers and Filipinos alike, there should come an industrial awakening which will in a short time transform these fair islands into gardens of wealth and attractiveness.

Adequate steps have already been taken to protect the valuable timber growing on the vast forest domain of the Philippines of some 50,000,000 acres, and indiscriminate destruction of the trees will not be permitted. The forestry department in the islands has been carefully organized, and expert foresters are in charge. Besides protecting the timber from the vandals and lumber speculators, the foresters are making careful surveys of the woods to ascertain their actual resources and value. Much of this timber is too valuable for building purposes, the trees for the most part consisting of the heavy hardwoods of the tropics, and it is intimated that it will pay to ship cheap pine lumber from our Pacific coast for building and bring back the heavy woods for commercial cabinet purposes. If such an exchange of products is desirable, the work should be encouraged at the beginning, and not left until half the valuable timber of the islands has been destroyed. It is the policy of the forestry bureau on the islands to protect the forests, and to encourage their scientific culture. This will insure an annual crop of valuable trees, and at the same time preserve the woods for all time. In the tropical woods of the Philippines the trees grow so rapidly that a thinning out process can be pursued, so that millions of feet of valuable timber can be cut every year. It is possible to go over the same forests year after year and find new available timber ready for harvesting. There should be a steady income from these hardwoods of the islands amounting in the aggregate to millions of dollars. As conducted in the past, the forests have practically yielded the government nothing, and the inhabitants have wasted their resources, so that they have found little actual profit in their great natural possessions.

Scientific experts who have examined the forests of the islands intimate that the greatest calamity which could possibly visit our insular possessions would be the denudation of the forests. The climatic changes that might follow would completely transform the conditions of agriculture. On the other hand, judicious cleaning up of woods and swamps would produce beneficial changes of an agreeable character. There are water courses and streams which might well be reduced in volume and intensity without interfering with the agricultural conditions elsewhere. The final policy of forest culture which the experts will recommend will probably tend toward the climatic and agricultural improvement of all the islands. There will be openings for the new American colonists who will undertake scientific forest culture of the most promising kind. The possession or leasing of these forest lands will be regulated in such a way that denudation will be visited by prompt ejectment and punishment. But it is unlikely that an owner of hardwood timber lands that furnish a good income each year will decide to kill the goose that lays the golden egg. The export trade in valuable hardwoods will increase in proportion to the scientific culture and harvesting of the forests by settlers who have been trained for the work. Expert foresters represent to-day a new profession in this country, but their services in our island possessions will be even in greater demand than at home.

This class of new settlers will be of a higher grade than those who file petitions for the ordinary 160 acres of homestead farming land to secure title by living on and cultivating the same. Expert foresters are not numerous, and their services are needed to develop the forests. It is not possible that others will secure possession of the valuable timber lands of the Philippines, so strict is the forestry department of the islands. On the other hand, there will be urged the necessity of intelligent settlers undertaking the development of forest farms. Under the direction of public foresters it is possible to train a class of practical farmers who will wisely conserve the interests of both the government and the settlers. The small settler is more likely to preserve his possessions of hardwood timber than the lumber speculator, whose chief interests are concerned in robbing the forests of all he can secure in a few years. Forest culture of the hardwoods may thus become an important industry of the new colonists who go to the Philippines under the homestead law.

The time is apparently ripe now for making inducements to attract settlers to the new public domain of the United States, and both the Secretary of War and the Insular Bureau have been urging Congress to enact some homestead legislation. There is little possibility of a great industrial and agricultural development in the islands without some inducement being held forth to American settlers. There are some forty to fifty millions of acres of land in the islands which belong to the Federal government, and much of this is the richest of agricultural and mining land. The disposition of this vast domain must carry with it a great amount of responsibility for those who have the matter in charge. Land records have been very loosely kept in the islands, and a good many of the natives claiming land have no deeds or other titles to show that their possession is a legal one. To determine the legal ownership of great tracts of the land will require years of study and survey, and possibly numerous decisions of the Supreme Court. But outside of the land which is held in dispute there is a vast tract of which the government has unquestionable ownership, and the opening of this public domain to American settlers according to the homestead rights will be sufficient to attract thousands of new colonists to the islands.

G. E. W.

MORSE'S OLD DIARY AND ITS PROPHECY.

In the Electrical Review there appears a portion of the diary kept by Samuel F. B. Morse during his earliest work on the Baltimore and Washington telegraph line in 1843. The book was discovered in the library of Thomas A. Edison, at Orange, N. J., and contains what are evidently the first records.

The first entry in this diary is dated March 14, 1843, and consists of a copy of the letter from the Secretary of the Treasury, J. C. Spencer, giving instructions as to the handling of the appropriation made by Congress for this experiment. The reply of Morse and other correspondence in the diary give a striking idea of the troubles which beset the pioneer's work, as well as of the untiring energy with which the inventor developed his great ideas. He never seemed to lose heart over the failures of others, which he had to overcome constantly. Under date of August 10, 1843, Mr. Morse describes certain tests he had made, and makes the following interesting prophecy:

"The practical inference from this law is that a telegraphic communication on my plan may with certainty be established across the Atlantic. Startling as this may seem now, the time will come when this project will be realized."

Commenting on this prophecy and old-time record, which is virtually the story of the beginning of the vast electrical industry of to-day, the Electrical Review says:

"How well this prophecy has been fulfilled! To-day there is no ocean unspanned by a telegraphic cable. This old record of the first work in telegraphy takes added interest from our latest accomplishments. We have completed the first Pacific cable and have made a good start on the second, and Marconi has established communication across the Atlantic without wires. It is difficult to realize that this diary was written less than sixty years ago. Who will venture to predict the electrical developments of the next sixty years?"

WIRELESS MESSAGES TO A MOVING TRAIN.

On the occasion of the recent Forty-seventh Annual Convention of the American Association of General Passenger and Ticket Agents, the Grand Trunk Railway gave a demonstration of wireless telegraphy on a moving train. The experiment was entirely successful.

The demonstration was made by Dr. E. Rutherford, F. R. S. C., and Dr. Howard T. Barnes, F. R. S. C., both of the Macdonald Physical Laboratory of the McGill University, Montreal. Signals were exchanged between a station and a train (which was running at the rate of 50 miles an hour). No attempt was made to cover distances comparable in length with those attained by Marconi and others, but with comparatively simple laboratory apparatus it was possible to keep the train in touch with the station for from 8 to 10 miles. St. Dominique was selected as the transmitting station, where two large metal plate vibrators 10 x 12 feet, connected with an induction coil of the usual pattern, were situated. On the train itself the waves were received by collecting wires connected to a coherer of nickel and silver powder. The relay operated electric bells in three cars. The collecting wires were run through the guides for the train signal cord, and extended on both sides of the coherer for about one car length. To obtain the maximum effect it would have been better to have had a long vertical wire, but since such was impossible, the horizontal wire was used. Although these were placed *inside* the steel frame cars, strong and definite signals were obtained over the distance named. Another difficulty militated against obtaining the maximum sensitiveness, as owing to the natural vibration of the train resulting from its great speed, it was impossible to have the relay adjusted to its most sensitive point. In spite of these difficulties the distance to which signals could be sent to the train was eminently satisfactory, and with more refined apparatus greater distances could without doubt be covered. The success of this form of wireless telegraphy, of which this was but a pioneer experiment, opens up yet another method of providing for the safety of the traveling public.

SCIENCE NOTES.

It is rumored that A. Lawrence Rotch, of Boston, is to lend his aid in solving the meteorological problem concerning the permanent circulation of the atmosphere at altitudes greater than 15,000 feet. It is said that the German government is to furnish Mr. Rotch with a ship equipped for a three months' voyage in the tropics. The necessary apparatus and expenses are to be paid for by American scientific men.

E. Tardy has studied the oil of Chinese anise, the oil of Japanese anise and the oil of fennel. He finds that Chinese anise oil contains pinene, phellandrene, estragol, a dextrogyrate terpilenol, anethol, a levogyrate sesquiterpene, anisic aldehyde and acid, together with traces of a crystalline body of the formula $C_{20}H_{22}O_3$, and of the ethyl ether of hydroquinone. The author attaches some importance to the presence of the terpilenol, to which he considers the particular odor of Chinese anise is due. The result of his study of Japanese anise (*Illicium religiosum*) shows that the oil has a low rotation.

Princeton University recently received from John M. Clarke, New York State palæontologist, the body of an octopus-like creature, from Onondaga Lake. Dr. Ortmann examined the specimen and found it to be a cold-water, short-armed squid, a species of devil-fish prevalent along the Atlantic coast from Cape Cod to Newfoundland. The fish was a salt-water specimen, and how it came to be found in fresh water is not easily explained. To be sure, the specimen examined by Dr. Ortmann differs from the ocean-bred squid in that it has not the delicate membranous folds on the arms that stretch out from its body. It may be that these folds constitute a real variation, but Dr. Ortmann is inclined to believe that the membranes have been lost through abrasions or imperfect preservation. In every other respect the New York squid resembles the ocean kind.

The Stanford University has received curios gathered by Mrs. Stanford during her long sojourn in Egypt. The collection is interesting, not because it contains many specimens of ancient Egyptian art, but because of its modern historic value. One of the most precious *trouvailles* of the collection is a set of volumes recounting the history of the occupation of the Nile country by the French, and producing in colors the discoveries and conquests of Napoleon. The volumes were compiled by Napoleon's orders in 1812. A set of fine reprints in from twelve to eighteen colors of originals dealing with recent discoveries in the ruins of Karnak, also constitute an important part of the collection. Besides these there are cases of gold embroideries, the work of the women of a great harem in Cairo; large numbers of ancient coins, vases and lamps, statuettes, and bas-reliefs of pottery.

The appetite of a whale is phenomenal. His chief diet consists of jellyfish. He has simply to open his mouth and paddle along leisurely in order to take in jellyfish by the wagon-load. Such is the method adopted by the whalebone whale. The sperm whale, on the contrary, captures huge squids weighing often several tons. Like his brother the whalebone whale, he must be constantly on the lookout for food. Otherwise he would starve. As many as fourteen seals have been taken from a thirty-foot "killer." Other fishes of enormous appetites are not uncommon. The bluefish, for example, thrives on sardines and other small fish. Assuming that one bluefish eats ten small fish a day, it has been figured that it requires ten thousand million sardines to feed the one thousand billion bluefish on our coasts every summer. Most curious of all eaters is the hydra—a strange creature that can be turned inside out without impairing its appetite or its power to eat.

THE CURRENT SUPPLEMENT.

The current SUPPLEMENT, No. 1412, opens with an elaborately-illustrated article on the steam yacht "Aztec." Dr. Marcus Benjamin has made an abstract of some of the more important scientific papers presented before the Washington meeting of the American Association for the Advancement of Science. The English correspondent of the SCIENTIFIC AMERICAN discusses, in the fifth installment of his series on water-tube boilers, the well-known and widely used Niclausse boiler. John Joseph Flather sets forth modern tendencies in the utilization of power. An account of the diversity of the uses of cold storage, by Day Allen Willey, should be read with interest. To exporters, Consul T. H. Norton's admirable summary of commercial conditions in Asiatic Turkey will be of value. The well-known manufacturing chemist W. J. Schieffelin discusses the advances made in pharmaceutical machinery and methods in the last half century. Fred T. Jane presents another installment on the naval war game. His present article tells how hits are determined. Automobilists will read with interest an account of the autochronograph, a new electric timing device for automobiles. The usual Consular Notes and Selected Formulæ will be found in their accustomed places.

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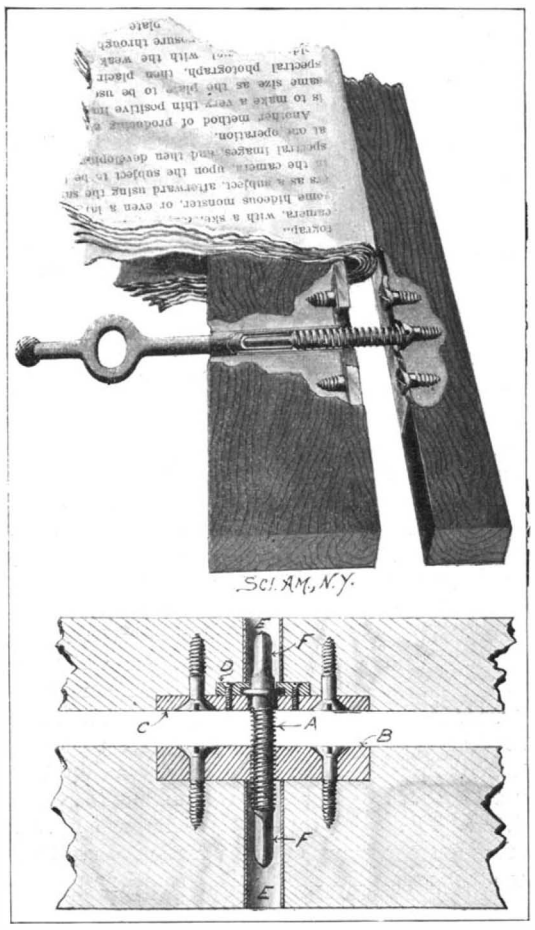
IMPROVED PAPER FILE.

A patent has recently been granted to Mr. Edmund W. Sandstedt, of Hankaw, China, for a paper file



PAPER FILE WITH NO PROJECTING PARTS.

which cannot be opened without the use of a key. This, in a great measure, will prevent an unauthorized person from removing papers from the file, at least without tearing them out. The construction of the device further offers the advantage of having no projecting parts to mutilate the papers, scratch furniture, or catch in the clothing to the inconvenience of the reader. The file comprises two rods held together at each end by a locking device and designed to engage opposite sides of the paper. Two forms of locking devices are illustrated which differ from each other only in the fact that the construction shown in the large detail view is reversible, and this construction may be described as follows: An adjusting screw, *A*, is secured with a swivel connection to one of the rods; this is effected by seating the collar on the screw between the plates *C* and *D*. A plate, *B*, is fastened to the other rod and is provided with a tapped pole adapted to engage the adjusting screw. The opposite ends, *F*, of the adjusting screw project into the openings *E* of the rods, and are made angular to fit the key. When it is desired to remove or add a paper to the file the rods can be separated by fitting the key over one of the adjusting screws and turning the screw to feed out through the plate, *B*. The adjusting screw at the opposite end is then similarly turned outward until it also disengages with the plate, *B*. The rods are thus released from connection with each other, and the necessary changes in the file are made. From the fact that adjusting screws are used for locking the rods together, it is obvious that a single sheet may be as firmly held in this paper file as a month's issue of daily papers.

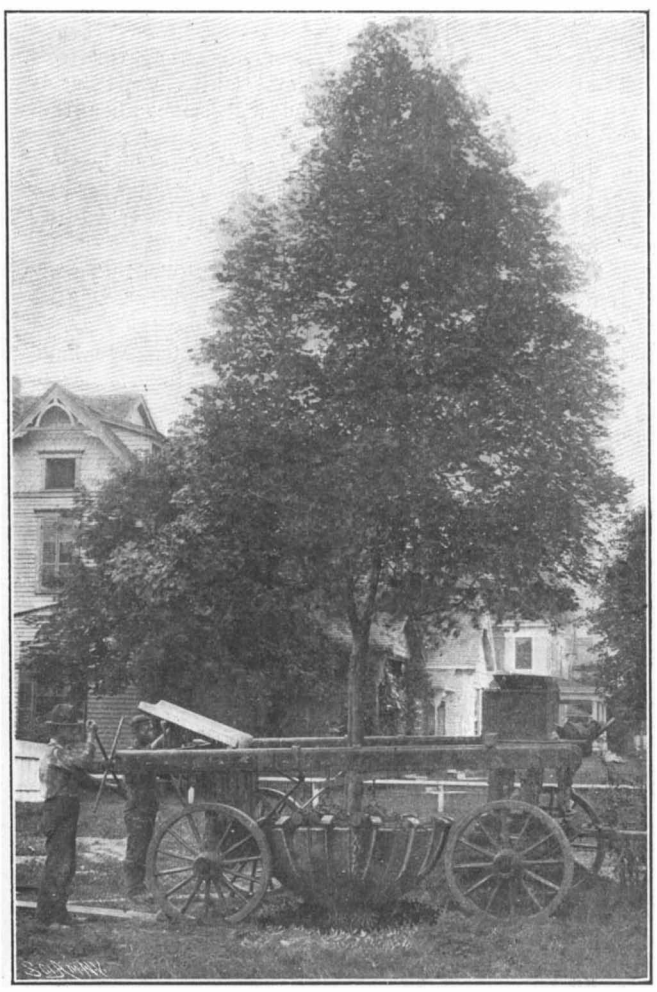
A NEW METHOD OF TRANSPLANTING LARGE TREES.

Several months ago the SCIENTIFIC AMERICAN described and illustrated apparatus invented by Mr. Henry Hicks, of Westbury, Long Island, for taking up and transplanting large trees. Another system has been invented and is being quite extensively utilized in the West. It is the idea of Mr. John A. Wilkins, of Indianapolis, but in utilizing it the trees are transferred from bed to bed in midsummer in preference to the spring or fall, the usual seasons preferred. Mr. Wilkins believes the tree is in its most flourishing condition during the summer, and this is the best time for transplanting, as there is less danger of checking its growth or injuring it in other ways.

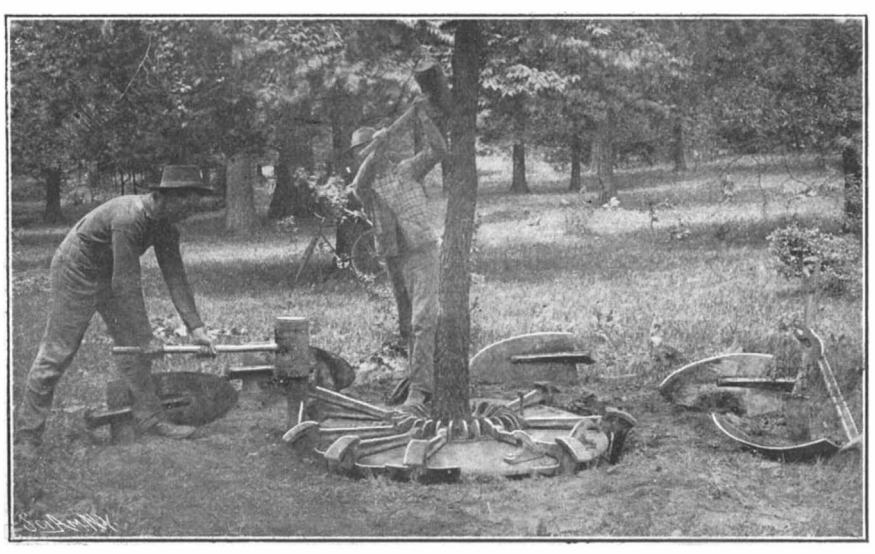
The Wilkins plan is quite similar to that followed by florists in transferring potted plants, special care being taken to avoid disturbing the earth immediately about the roots of the tree, as well as to avoid injury to the smaller roots and tendrils. By the Wilkins invention the tree which is being transplanted is never handled in any other way than from its base. In short, to explain the method in a nutshell, it may be stated that the earth and roots are incased in a steel basket of any required size, which corresponds to the flower pot of the florist. The first operation in transplanting a tree by this method is to thoroughly wet the earth about the tree, softening the ground. Next in order is the placing in position of the steel basket, which is made of curved steel shovels. A medium-sized machine, inclosing earth and roots, six feet in diameter, is composed of fourteen shovels made of five-sixteenths-inch plow steel, each of the shovels being hinged to a steel platform surrounding the tree. After the shovels have all been driven into place they are firmly secured to the platform by crossbars, by which the whole tree can be lifted from its bed.

The lifting apparatus is then adjusted about the tree, and two men lift the tree out of the ground by screw power, raising it to its position in the transporter. The operatives have complete control of the machine at all times, and the tree may be raised, lowered or held at will. After the tree has been removed from its old abiding place, it is laid back on the cushion of the skeleton wagon, which is to convey it to its new location, and is thus transported through the streets of the city, being at such an angle that the branches pass under telephone and telegraph wires and other overhead obstructions. Incidentally it may be noted that the tree rests so lightly upon the cushion that there is no strain whatever upon the body of the tree.

Upon arrival at its destination, the tree is slowly lowered into the hole which has been prepared for it, and after the transporter has been removed, the earth is filled in and tamped about the basket. When all is secure, the shovels are withdrawn, leaving the tree fully embedded without the loss of any of its original surrounding earth containing its fibrous or hair roots.



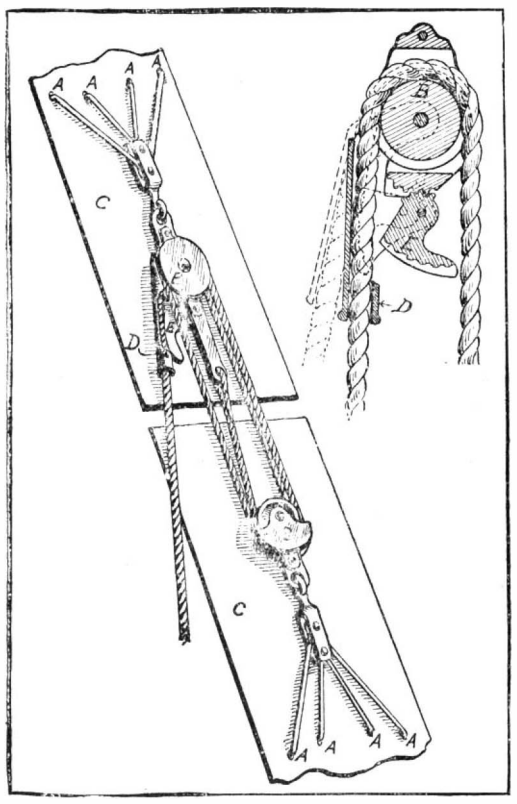
The Tree on the Wagon.



Driving in the Blades.

A NEW METHOD OF TRANSPLANTING LARGE TREES.

Among the advances in practice to be noted in this latest tree transplanter is the operation of the lifting and conveying device according to the points of the



IMPROVED BELT STRETCHER.

compass, rendering it possible to plant the tree in exactly the same position in which it stood originally.

As indicated by the illustrations, the vehicle for conveying the tree is built with heavy framework, which can be raised and lowered by the screws upon the trucks. The power is so adjusted that two men can handle a tree ranging from 30 to 40 feet in height without difficulty. Maples, elms and other shade species, having trunks ranging from 5 to 7 inches in diameter, have been transplanted by this process in the suburbs of Indianapolis, and though the operation was performed during the summer, they are apparently in as good condition in their new bed as before being moved.

BELT STRETCHER.

We illustrate herewith an improved device for drawing together the ends of belts so as to facilitate lacing them together. The device comprises the combination, with a tackle, of peculiarly constructed grippers, which are arranged to engage the end portions of the belt, so that by means of the tackle the ends may be brought together and held during the lacing operation. In using the device the ends of the belt, *C*, as indicated, are perforated by an awl, so that the points of the gripping fingers, *A*, may be easily engaged with the belt. The fingers are spread out so as to place the strain uniformly on the belt, and by having the ends of the fingers in different transverse lines, the puncture of the belt in a straight line across its width is avoided. This, therefore, enables the belt to be perforated for the engagement of the gripping fingers without materially weakening its strength. After the gripping fingers have been properly engaged with the belt, the fall of the tackle should be drawn on, thus drawing the blocks, *B*, and consequently the ends of the belts, *C*, together. Then by operation of a locking device, *D*, the movement of the blocks apart is prevented, so that the lacing or fastening operation may be conveniently performed. Any suitable locking device may be employed, such as that illustrated in the sectional view, in which the cam, *E*, is adapted to engage with the fall and prevent its backward movement. The dotted lines show the positions assumed by the different parts when the cam is thrown into gripping position against the rope.

It will be observed that the stretching device does not occupy, when in operation, a position outward from the side edges of the belt. This is particularly advantageous in the practical employment of the device, since it enables the operation to be carried on in crowded or confined places, particularly in belt housings and the like, such as are common in grain elevators. Further, by employing the tackle, the belt may be drawn together without the operation of any such device as a crank or other mechanical element requiring considerable room for its operation. A patent for this belt stretcher has recently been granted to Mr. D. R. Davis, Nemaha, Iowa.

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AN AUTOMOBILE STREET CAR.

BY W. E. PARTRIDGE.

The illustrations accompanying this article represent a highly interesting novelty—an automobile street car built for Thebaud Brothers, of this city. Although Yankee inventive ingenuity has been directed toward this end for perhaps fifty years, success has not been heretofore attained by any of the designs which have been tried. Steam has failed chiefly for want of adhesion. The storage battery car has been too heavy. The compressed air schemes seem to have failed from a complication of difficulties, one of which, and perhaps the most important, was lack of adhesion. Singularly enough, the present successful combination is not the result of Yankee enterprise. The idea comes to us from the city of Merida, in Yucatan, and the successful car is the result of the persistent efforts of Señor Don Nicolas Escalante-Peon, at present Director-General of the Consolidated Railway systems of Yucatan. After using and becoming familiar with American-built automobiles of various systems, and after

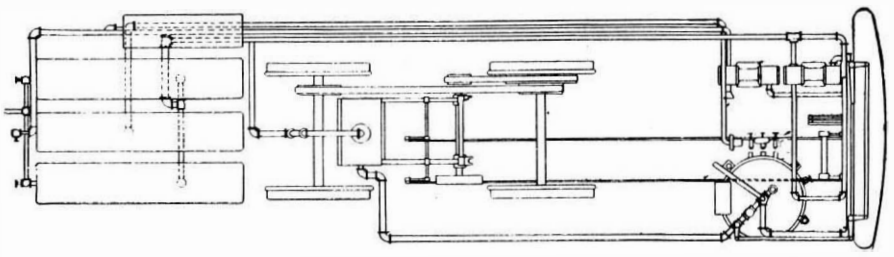


Fig. III.—Plan Showing the Drive Connection Between Car Axles

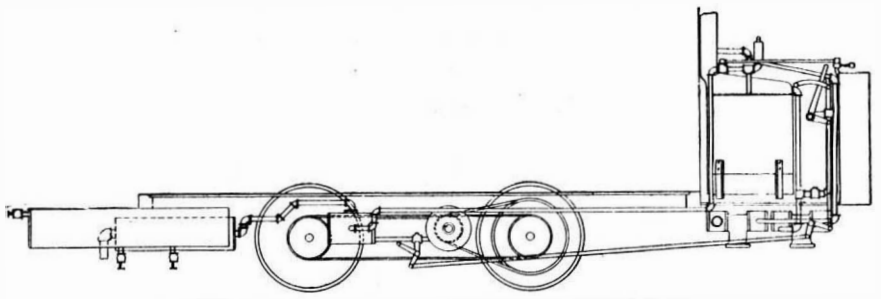
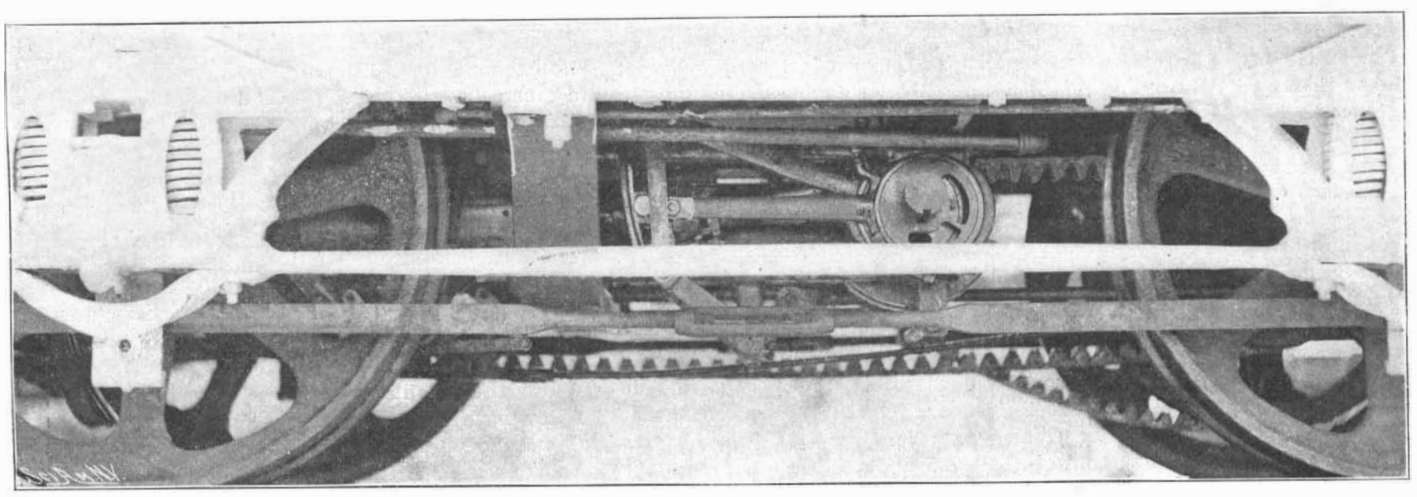
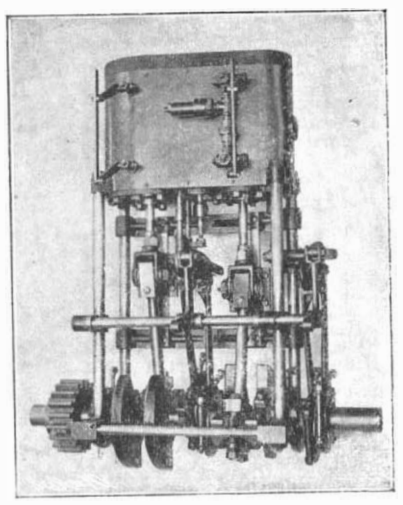


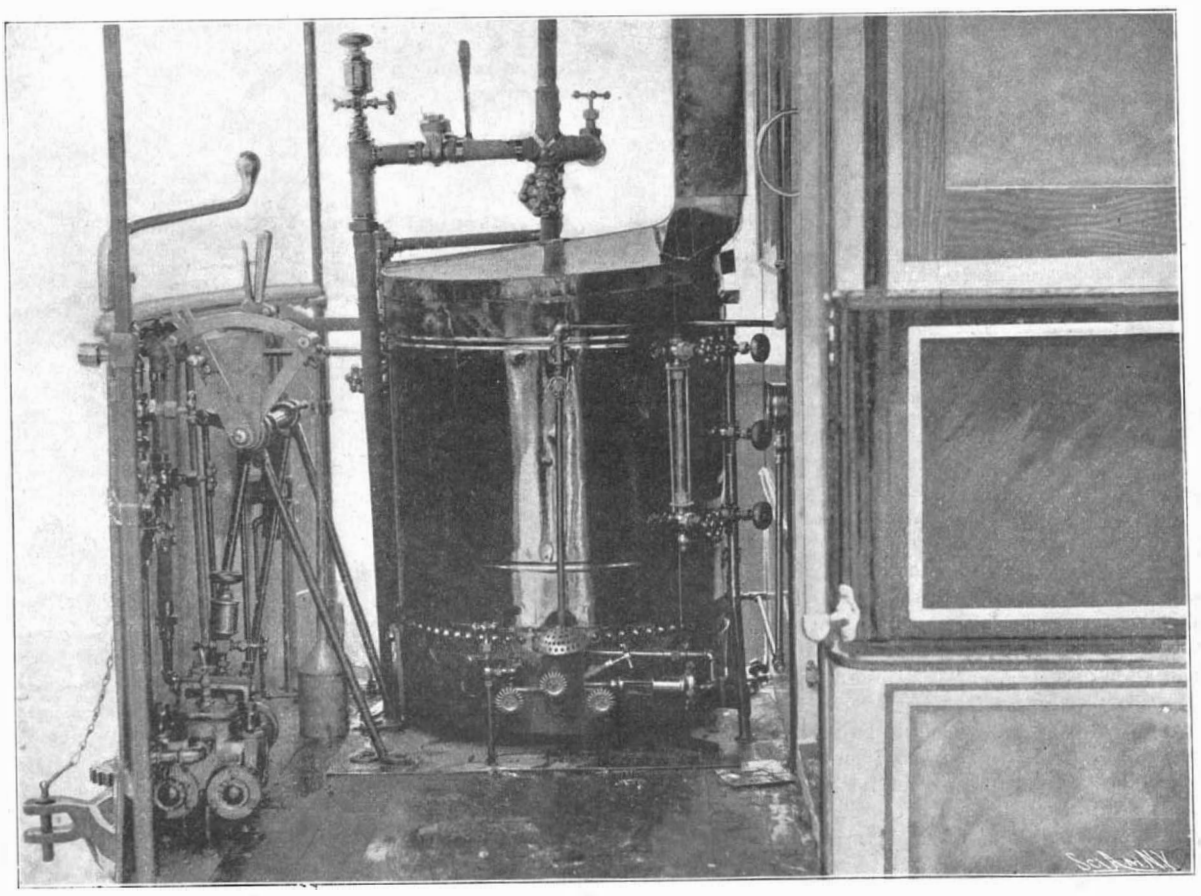
Fig. II.—Side Elevation; Storage Reservoirs at Left End.



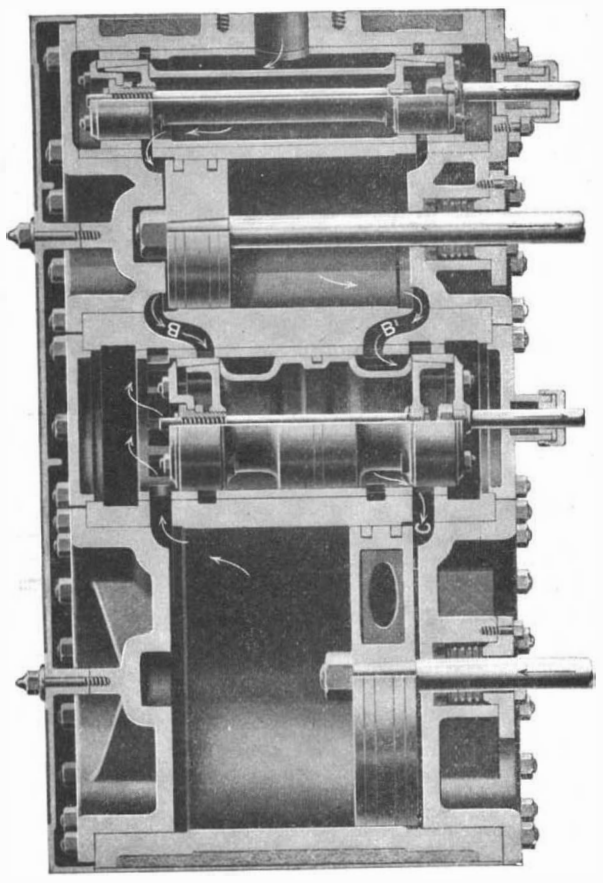
Looking Under the Car Showing the Engine Shaft and Drive Belts.



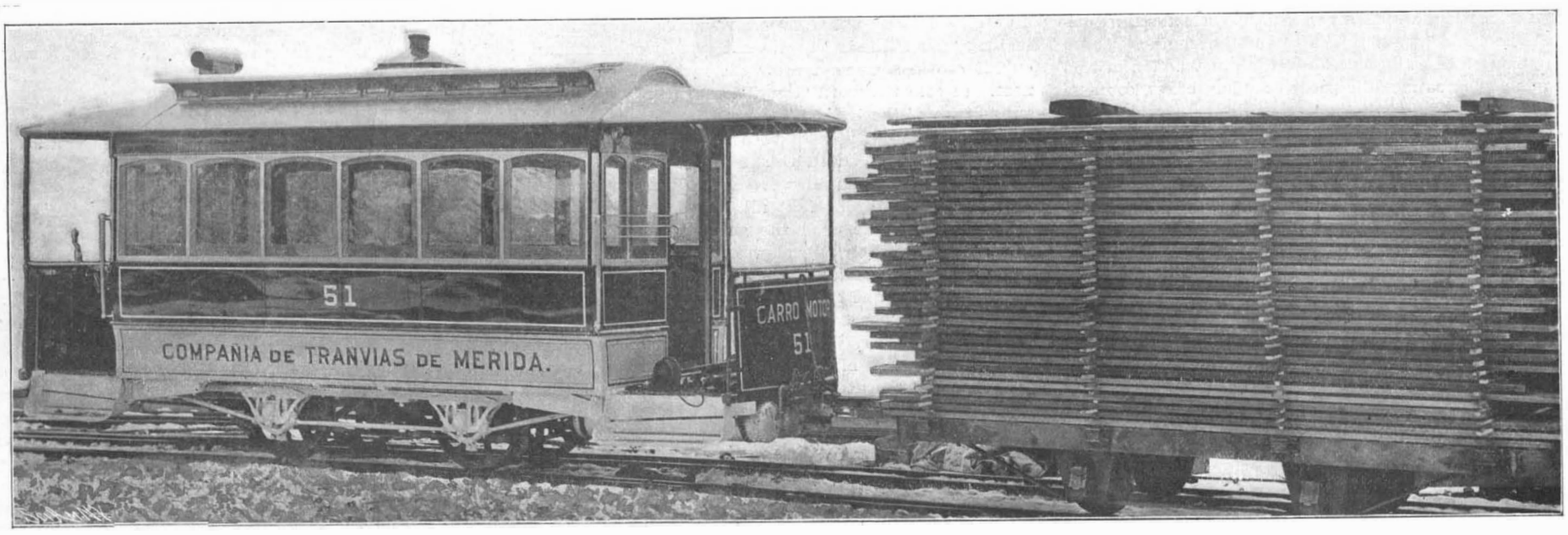
The Engine, Counterweights and Driving Pinion



The Boiler, Pumps, Reversing Lever and Throttle Lever on Front Platform.



Sectional Elevation of the Compound Engine.



A NEW STEAM AUTOMOBILE STREET CAR.

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trying unsuccessfully gasoline motors attached to street cars, the case was put about in this way: "Steam automobiles are successfully used which weigh as much as our street cars, and operate at a higher rate of speed than we require. Send us out a car of our standard patterns, to be operated like an automobile." It was a difficult task to find firms willing to undertake this apparently simple engineering problem, and some two years has elapsed since the order was given to execute the idea. The John Stephenson Company, of Elizabeth, and the Reeves Engine Company, of Trenton, N. J., finally undertook the construction of the car and the equipping of it with an automobile engine of sufficient size and power for the purpose.

Our lower engraving represents an external view of the car with a truck load of lumber attached to it as a trailer, for the purpose of testing its power. The car body is 14 feet long, similar in every respect to the street cars used in the city of Merida.

The street railway system of Merida is an extensive one, but peculiar in that it radiates from the central plaza in all directions. The gage is 3 feet, and the motive power hitherto employed has been the small mules of the country, singly and in pairs. Switches and turnouts seem to be the exception rather than the rule, and the cars from the different lines come into the plaza in succession, so that the last in is the first out. As electricity is out of the question, the need for a self-propelled unit becomes unusually great.

The small size of the car is in some respects advantageous, but the narrow gage makes it difficult to find space for the machinery. The arrangement is shown in Fig. II., which is a side elevation, and Fig. III., which is a plan. These diagrams show the machinery with the car body removed. The boiler is located at one side of one platform. The engine, shown in a vertical position, is placed horizontally between the wheels under the car body. There is barely room between wheels for the compact little machine and the necessary gear wheels and chain.

The large view shows the location of the boiler, pumps, etc., on the platform. In the long view, looking upward under the side of the car, will be seen one of the broad cradle straps, by which the engine is held against the heavy subsills of the car. The engine and driving machinery is, however, self-contained and does not transmit any of its strains to the car body beyond those occasioned by its weight.

The boiler itself is an upright tubular of the standard automobile pattern. It is 2 feet high and 2 feet in diameter, with an automatic burner suitable for either gasoline or kerosene. The engineer, standing by the side of the boiler, finds within easy reach the reverse lever, throttle whistle, and all the valves necessary to control the apparatus. In fact, this part of the car resembles a magnified automobile.

The engine and the driving apparatus present the greatest novelties. The engine is the Reeves Engine Company's new compound engine, modified to suit the peculiar conditions of automobile service.

One view shows a partial section of the engine and its frame. The cylinders are 6 inches stroke by 3½ inches and 6½ inches in diameter. Two piston valves are employed, both of them capable of being adjusted at each end by taking off bonnets. A remarkable economy in steam is obtained by reducing the clearance to an unusually small amount.

For stationary purposes the cranks are set, as shown in the upright view, at 180 degrees, and exhausting directly across the low-pressure valve without the use of a receiver. This was impracticable for automobile purposes. The cranks being of necessity placed at 90 degrees, changes have been made in the ports and passages, and the high-pressure cylinder exhausts into the space around the low-pressure valve, which is used as a receiver. The low-pressure valve admits steam to and controls the exhaust from the low-pressure cylinders. These valves are controlled by eccentrics and a link motion, which gives a very perfect steam distribution and a perfect control of the engine. There are many interesting details in the construction of this engine, such as metallic packed stuffing boxes, counterbalances for the cranks and other things highly important, but which cannot be mentioned here. The engine drives a crank shaft, or jack shaft, upon which is placed a gear wheel. On the axle opposite the cylinders is another gear wheel. These two are connected by a Renold silent chain gear. These chains have been very happily described as "flexible internal gears." The speed ratio is 3¼ to 1, the engine being geared down to the 30-inch driving wheels. Both axles also carry gear wheels of equal size, over which a second Renold chain is placed, thus making all four wheels drivers.

The secret of the success of the machine is largely due to the gears. The direct-connected steam motor has but a small fraction of the tractive force possessed by a geared engine. A three or four per cent grade represents about the limit which a direct-connected machine can overcome, while a geared engine can successfully operate on grades up to eight or ten per cent.

The engine, chains and gear wheels, and fixtures, weigh about 1,000 pounds. The boiler, pumps, etc., bring the total weight of the machinery up to about 2,500 pounds. The running gear and car body weigh approximately 5,500 pounds. This makes a total load of 9,000 pounds. Loaded with the equivalent of twelve or fourteen passengers, this car handles with ease around sharp curves the loaded four-wheel truck shown in our lower engraving. This was a loaded lumber car, weighing about 9,500 pounds. The test was made in order to ascertain whether the car could handle a crowded trailer with ease, and it was evident that it could do so. Probably two of the smaller cars used in Merida could be hauled when crowded to their utmost capacity.

The steam pressure is 225 pounds, and the boiler is capable of maintaining this pressure when the engine is working to its fullest capacity. In the cases of the trial trip, the car on one occasion, without a load, pushed the trailer, weighing more than 9,000 pounds, with perfect ease on the straight track.

This car illustrates the fact that an invention or an idea cannot always be made successfully until the times are ripe for it. In this case we have the necessary features of a compact, efficient compound engine; a driving chain; a safety boiler; a burner, automatically controlled; liquid fuel; a compact direct-acting steam pump; an air pump, and an injector. All these individual features are the result of years of experiment in their lines, and success would be hardly possible with any one omitted.

INDIAN PHYSIOGNOMIES.

BY GEORGE WHARTON JAMES.

The study of facial characteristics has always been interesting. "The eyes are the windows of the soul," the poet tells us; and there are few people who do not believe themselves competent to judge somewhat of character from what the face presents. Lavater and his followers believed a definite science could be constructed, the laws of which would infallibly determine the reading of character from facial or physiognomic characteristics. Later scientists, while discarding Lavater's ideas, are emphatic in their statements that important ethnologic truths may be learned by careful study and competent measurements of facial, cranial, and other physical developments. Much work recently has been done by Dr. Hridlika, of the Hyde Exploring Expedition under the direction of the American Museum of Natural History of New York, along these later lines.

A few notes on Indian physiognomies may therefore not be without interest to the readers of the SCIENTIFIC AMERICAN. The Indians pictured are of the Mohave and Yuma tribes, residing on the Colorado River, on both the California and Arizona sides, and the photographs were made on a trip I took by boat from the Needles to Yuma in February of last year.

These tribes are akin and are classed by Powell as the Yuman family. By some they have been regarded as of Apache kinship, but there is little, either in their language or in any other characteristic, to connect them with this Arizona branch of the great Athabascan family.

One thing is especially noticeable, and that is that all the older men have very wrinkled faces. These marks of time, of Nature's stern furrowing, seem to me to have one clear significance. It is the outward and visible sign of the pathetic struggle for existence which has been never-ceasing in the history of most aboriginal races, and especially so since the advent of the white man. Indeed, when I made the photograph (Fig. 1) of a Mohave Indian he was telling me of the hard fight he was having to get a sufficiency to eat for himself and his family. It is not a distinctively Indian face. Dressed as a white man, smoothed and straightened up, he would not be far from a Caucasian in appearance. His lips are not so thick, the base of his nose not so broad, and his cheekbones not so high as those of most of his tribe. His hair was done up in long "towy" kinds of rolls, and then wound around on his crown somewhat after the fashion of the Chinese. (I coin the word "towy" to suggest the tow-like appearance of the hair as seen in Fig. 2.) The major portion of the old men of both the Mohaves and Yumas wear their hair in this fashion, and it is this custom that led the Indian Department a few months ago to issue an order that all Indians who were in any way dependent upon the government for bounty or pay must cut their hair shorter. Fig. 2 is of a much older man, toothless and almost blind. He is a tall, stately Mohave, and must have been a physical giant in his youth. The square jaw, thin lips (for an Indian) denote power. Yet there is a singular gentleness shown in the arch of the nostrils. The large coronal or brow development is remarkable. If one covers the eyes and back of the head, and looks but at the nose, lips and chin, an astonishing resemblance is readily seen between this face and that of Gladstone.

I doubt very much whether the most renowned physiognomist could have read cannibalism in the face of the Indian pictured in Fig. 3, but if his own confession goes for anything, he has often been a consumer of human flesh. Though he wears a beard, he has more genuine Indian characteristics than either of the two hitherto considered. His nose is flat at the base, cheekbones high, lips thick, and his eyes are dark, liquid, and large. There is something positively "ogreish" in the manner in which he licks his lips and rolls his eyes when reciting his cannibalistic feats before the campfire to a circle of his admiring tribesmen.

Figs. 4 and 5 are front and side views of the same Mohave. Here is a pure Indian face, with a strange resemblance to that of the late Li Hung Chang. In the smile, there is a jolly good nature shown. The profile view is by no means displeasing, though the front face shows broad base of nostrils and thick lips. The eyes are diseased, as those are of many of his people, undoubtedly owing to the constant sitting over the smoky fire of a chimneyless hut. The cheekbones are not protuberant; the ears are well shaped and set on the head. In marked contrast to most of their people, this Indian, as well as the one pictured in Fig. 3, have beards. It is one of the most common of sights to see the Indian, with small mirror and a pair of tweezers, pulling out the hairs on his chin and upper lip one at a time. This, and not that they cannot grow a mustache and beard, is the explanation of their general hairless lip and chin.

The next group of four photographs is of Yumas all belonging to the so-called friendly faction of this tribe. In almost every tribe are to be found two factions, corresponding somewhat to Conservatives and Liberals. The former are those who wish to adhere to the "ways of the old"—the habits, customs, ceremonies, religion, and general procedure of their forefathers; the latter compose the progressive element—those who are willing to forsake the old ways, and, ostensibly at least, follow the Washington way. While the effect of this following the new way may be of benefit to their children, there is little doubt in the minds of those who know them that the old men follow the new way because of the "loaves and fishes" associated therewith.

Fig. 6 is of Pasqual, the leader of the Friendlies. While present with the Yumas, I got the chief of the hostile faction to call a powwow, in which I stated my desire to photograph them, and why. There must have been fully a hundred men, women, and children present, and their resentment to the whites was open and pronounced. The chief said little, and it was soon evident that he was a mere puppet in the hands of Miguel, the orator and spokesman of that faction. This man is a disappointed politician. Because he could not be selected chief, he is determined to give the authorities all the trouble he possibly can. It was his son, it is generally believed, who set fire some time ago to one of the Fort Yuma school buildings, out of revenge for his father's defeat and to show that he himself had daring blood in his veins.

The result of our powwow was a refusal to allow themselves to be photographed, and a request that the whites leave them alone and allow them to walk in their own ways.

Defeated in photographing the Hostiles, I appealed to the Friendlies, with the result that I was rebuked for not first going to them. The policeman (Fig. 7) was eminently mortified. His face is narrower than Pasqual's, and in his policeman's uniform few would take him at first sight for an Indian. It is astonishing what a great change follows the cutting of the long matted hair, and the removing of the bands and other articles of Indian wearing apparel and substituting therefor the dress of the white man. If it were not for his dark skin, the Indian of Fig. 7 could walk through any city and not be suspected as an Indian.

Fig. 8, though of a young man, is a far more decided Indian type. Forehead, nose, lips, chin, cheekbones, and eyes, as well as hair and skin, all speak him an Indian. He is one of the leading athletes of the tribe, and is skilled in playing a pole and hoop game common to many Indian peoples and described by Catlin long ago as the chief game of the Mandans.

Fig. 9, too, is an Indian face, though much less so than some of the others. There is a keenness about these eyes, though old, and a general look about the mouth that denotes cruelty, and he is one who, in olden times, would have added a little more torture to that already decreed against any enemy hapless enough to fall into their hands.

Of the Mohaves it may generally be said that they are the most degraded tribe in the southwestern part of the United States to-day. They are the lowest in the moral scale from our standpoint, having not the least idea of morality as we see it. They believe God—their God—to be dead, but that his spirit is alive and is an evil spirit corresponding to the devil of the orthodox whites; that he resides in the Needles Mountains (passed by all transcontinental passengers on the line of the Santa Fé Railway as they cross the great bridge over the Colorado River at the Needles). This spirit acts as a judge before whom all the spirits of the dead Mohaves must pass ere they are allowed to enter into their Paradise, which is located on the Williams Fork of the Colorado River.

The Yumas are slightly more progressive, having

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come in contact more with the whites since the establishment of the city of Yuma. Their children, too, seem to make better progress in school.

These pictures and the accompanying remarks, though necessarily brief and cursory, will show, I am sure, that there is a great field for the physiognomists of every school among the Indians of the American Southwest.

Safety Exploder for Wet Guncotton Shells.

A new safety exploder for use with wet guncotton shells has been invented by the New Explosives Company of London, the use of which may affect the charges for heavy artillery. Wet guncotton has been generally regarded as one of the safest and most powerful explosives in existence. The only objection to its general use for shell purposes hitherto has been that, to insure complete detonation, a primer of dry guncotton and a fulminate of mercury detonator have been required, and both of these agents are too sensitive to premature ignition to be of any practical utility. The new safety exploder contains neither dry guncotton nor fulminate of mercury, but it will detonate wet guncotton with certainty and safety, and will not detonate itself under a temperature of 360 deg. C. It cannot be ignited by friction or shock, but at the same time it is brought into action with an ordinary detonating pellet such as is commonly employed in percussion or time fuses. The force then exerted will detonate in its turn any charge of wet guncotton, without leaving any traces of unburnt explosive or residue. The composition is very stable and stands an excellent heat test. At Ridsdale, the explosive experts of the British War Office witnessed a series of experiments with this material. The main bursting charges of a shell were made by a new process introduced by the company, whereby changes can be formed in one block instead of being built up of smaller pieces. The first trial consisted of ten rounds from a 6-pounder quick-firing gun. The total weight of each shell was 5 pounds 10½ ounces, the weight of wet guncotton bursting charge being 3.5 ounces, and that of the explosive in the safety exploder 138.8 grains. The shell was fitted with the ordinary Hotchkiss fuse, Mark IV. The target was a ¾-inch steel plate, and the range about 150 feet, and arrangements were made for securing the fragments of the shell. A 7½-ounce charge of ordinary cordite was used. The weight of the pieces of shell recovered on these ten rounds varied between 4 ounces and 8¾ ounces, and the number of pieces ranged between 81 and 337. Of three rounds the chamber pressure and muzzle velocity were respectively 11.28, 12.26 and 12.39 tons, and 1,800, 1,827 and 1,838 foot-seconds. A second experiment consisted of the bursting of a 6-inch shell at rest in a closed cell in order to show that the exploder would work without shock of impact at short range. The wall of the cell was burst open by the force of the explosion of an ordinary cast shell weighing 119½ pounds, fully loaded. The fragments recovered numbered 2,122 pieces, their total weight being 65¼ pounds. The wet guncotton charge weighed 6 pounds 9 ounces, and the explosive composition in the exploder weighed 10.5 ounces. The fuse was of the ordinary direct-acting pattern, and was fired electrically. Further trials showed that wet guncotton with this new safety exploder can be fired through the thickest armor plate without exploding until it had passed through.

A New Magazine Rifle.

It is said that the Danes have adopted a new magazine rifle for naval and military purposes. It fires, on the proving ground at least, at the modest rate of fifteen rounds a second, and allowing for reloading, 300 a minute. The magazine holds thirty cartridges. It is heresy, we suppose, to say so, but we are of opinion that there is an unnecessary fuss made about rapid-fire rifles. They have to be aimed to be of much service, and the time to aim cannot be reduced. The Danes, maybe, have read about the need of a ton of lead to kill a man, so propose to try and deliver the ton as quickly as possible. But, as the utmost a soldier can carry is 300 rounds, and supply is not easy in real war—ashore or afloat—there seems a fair chance of Danish warriors being short of their quota of the needful ton at critical moments. Afloat, this is beginning to be felt; and though the Vickers-Maxim firm, with the bare charge, have done much to save us feeling the "weight of ammunition problem," any advance in rapidity of fire seems likely to bring the problem back. Given a weapon that fires fast, men in battle are pretty sure to fire it as fast as they can.

Greatest Passenger Transportation in the World.

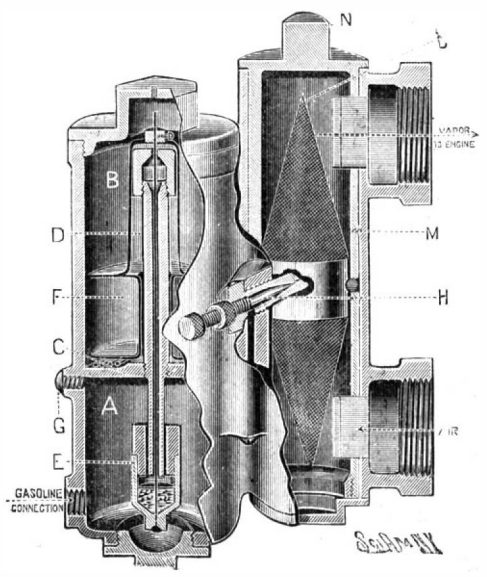
The elevated railroads of Manhattan and the Bronx are unmatched by any open-air steam railroad system in the world in the number of passengers carried each year. The report of the business done by these elevated railroads for the year that ended June 30 last shows that in that year 215,000,000 passengers (round numbers) were transported. It might have been added that they were transported without accident to one of these passengers excepting some trifling bruises.—Philadelphia Press.

AN IMPROVED VAPORIZER FOR GASOLINE ENGINES.

The cross-sectional cut of a gas engine vaporizer, or carbureter, seen in this column, shows very clearly its salient features, which are the invention of Mr. A. W. Olds, of Hartford, Conn.

The inventor's idea, in designing the vaporizer, was to do away with the needle-valve usually employed for controlling the flow of gasoline, and substitute for it an arrangement that would never fail owing to wear of the valve, such as sometimes occurs with the ordinary type. Mr. Olds had recourse to the difference in density of gasoline and mercury, in carrying out his idea; and the manner in which this difference is made use of, we will now describe.

The vaporizer is made up of two cylinders—the supply cylinder, filled with gasoline, and the atomizing cylinder, through which the air and vapor are drawn to the engine. The supply cylinder is divided by a horizontal partition, *C*, into two compartments, *A* and *B*, which are the gasoline feed chamber and the float-feed chamber respectively. A vertical tube, *D*, connects the two chambers, and a long, fine wire passing through this tube, is suspended from the bail of the float, *F*, by a collar and set screw, and carries at its lower end a cup, *E*, half filled with mercury. The gasoline, entering the small pipe hole near the bottom of the chamber *A*, rises through tube *D*, and, overflowing at its upper end, falls into chamber *B*. As this chamber fills, float *F* rises, carrying with it the mercury cup, *E*. When the surface of the mercury covers the bottom of the tube *D*, the gasoline forces some of



AN IMPROVED VAPORIZER FOR GASOLINE ENGINES.

the fluid up in the tube. This of course lowers the level slightly in the cup, allowing the end of the tube to become uncovered sufficiently for more gasoline to flow up in it, as a result of which the cup is again raised, and more mercury forced up the tube. A column of mercury is thus formed in the tube, and the gasoline bubbles up through it until its height becomes sufficient to balance the head of gasoline, when the latter will cease to flow. By this time the gasoline will have filled chamber *B* to within a short distance of the needle atomizer valve *H*, through which it is fed to the engine. When the engine is running, a small, steady stream of gasoline overflows from the top of tube *D* into the float-feed chamber, in order to keep up the level. That this stream is continuous, rather than intermittent, was demonstrated in a test made on a Westinghouse gas engine in the presence of the SCIENTIFIC AMERICAN representative.

Besides the mercury column for controlling the feed of gasoline to the float-feed chamber, the carbureter has a double valve in the vaporizing cylinder, for throttling the air inlet and vapor outlet. This valve consists of a sleeve *M*, adapted to be turned by a wrench on lug *N*. The sleeve has ports that match those in the cylinder proper, which are arranged with the lower one slightly smaller than the upper, so that there is always a slight vacuum in the cylinder, which tends to draw the gasoline through the needle valve *H*. By throttling both the vapor and air proportionately, the suction is always the same, and the mixture never varies, no matter at what speed the engine is run. The two wire gauze cones, *L*, serve to break up the gasoline and thoroughly vaporize it. These are not absolutely essential, however, and can be left off if desired.

The vaporizer is made of brass or aluminium, and will be found a most satisfactory article for use on all kinds of gas engines where absolute surety is wanted that there will be no leakage of gasoline. With it, an auxiliary shut-off cock is unnecessary, as the mercury column can always be depended upon for shutting off the gasoline flow when the engine stops.

Correspondence.

The Aerodrome.

To the Editor of the SCIENTIFIC AMERICAN:

My attention has been called to the communication of your Mexican correspondent, F. McC., in your issue of January 10, which is a fair criticism of the aerodrome illustrated by the writer in SUPPLEMENT No. 1399, for which is claimed the important characteristics of inherent stability and automatic control; also levity and translation through the air by a single physical action of aeroplanes operating under the simple law of the parallelogram of forces. He expresses the belief that the swivel support of the rider will not permit the rider's changing the plane of revolution of the aeroplanes by varying the center of gravity, and instances a floating barrel upon which a swimmer is trying to climb.

I may say that the reasonable assumption of your correspondent was anticipated and fully realized at the first conception of this type of machine years ago (caveat drawn in 1894), note taken, and provision made accordingly in such a way that, to a degree, a lighter, simpler, and cheaper combination resulted. A possibility was forestalled, and a fact, if fact it proved, curious as it may seem, was to be utilized to remedy a difficulty.

As to the barrel simile, your correspondent must admit that the boats and vessels of commerce, which approximate barrel shape, and probably descended from such primitive shapes, do not careen to such an extent as to render water navigation impracticable. Why? Because in the evolution of the art of boat building and operation, the tendency is minimized and rendered negligible.

It is hoped to show your correspondent and others whom it may concern, that notwithstanding his assumption of absolute prohibition, it will not be realized, or, more carefully stated, will not be apparent to a detrimental degree in the first machine produced, of the *type* illustrated.

As to steam power, it may be said this type of aerodrome lends itself to the adoption of steam prime movers very completely, and was so first designed, but set aside for a larger factor of safety. The trouble with it is, and always will be, the weight of water, or any substitute therefor, where lightness is a desideratum and considerable radius of action important. Condensation and the re-use of the water is, for the writer, entering too much into the refinements of this particular art at this stage. 'Tis best to follow the lines of least resistance. S. D. MOTT.

Passaic, N. J., January 12, 1903.

Irrigation in the Southwest.

There was recently begun in Texas what is planned to be the most extensive system of irrigation in the United States, for it involves the utilization of no less than 295,000 acres of land. A main canal will be constructed 100 miles in length, extending 30 miles from the town of Pecos in a southwesterly direction, crossing the Texas and Pacific Railroad 6 miles west of Pecos, and on to Toyah Lake, 7 miles south of Pecos, where one of the largest reservoirs in existence is to be constructed. From Toyah Lake the canal will run on and join the Williams Canal 30 miles farther down, finally emptying into the Pecos River 60 miles below Pecos.

The Cooper Hewitt Converter and Lamp in England.

The readers of the SCIENTIFIC AMERICAN are more or less familiar with Mr. Peter Cooper Hewitt's mercury vapor lamp. It will be gratifying for them to learn that it has met with no little favor in England. Lord Kelvin was unstinted in his praise of Mr. Hewitt's work. The Hewitt lamp, it will be remembered, resembles somewhat Macfarlane Moore's contrivance; but differs radically therefrom in the principle of its operation. Instead of employing rapidly alternating currents, Mr. Hewitt renders incandescent the vapor of mercury, for which purpose a low-pressure continuous current is employed.

Mr. Hewitt has also invented a new form of converter which it appears differs radically from the present machine for converting alternating currents into direct currents. In the course of his experiments with his mercury-vapor lamp, Mr. Hewitt evolved the present invention. From the meager details at hand we are unable to state precisely the form of the new converter, but we are informed that it is based on the discovery that certain vapors under peculiar conditions suppress certain portions of the alternating waves so as to change the flow into a direct current. The resulting current is pulsating, however, having the same frequency as the original alternating current. The apparatus is said to be very simple and extremely small as compared with the rotary converters now in use. It is also asserted that the new converter, in its present form, will handle voltages as high as 3,000, and that probably this figure may be increased to 10,000 upon further investigation and experiment.

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HOW A TELESCOPE WAS MADE AT THE JESUIT COLLEGE, MONTREAL.

Through the courtesy of the Rev. Father Foullety, we are enabled to give our readers an account of an undertaking, through which the Jesuit College at Montreal, Canada, has secured a telescope which satisfies all the demands made upon it. The telescope was built from the designs of the Rev. Father Garais, by the members of the Jesuit College. The spherical mirror of this telescope is in point of size the third in North America, being excelled only by those of the Yerkes and Lick observatories. No little admiration is due to the man who has not only designed the whole and constructed the principal parts of so intricate an instrument, but who has moreover with his own hand erected the machinery required for its production.

We are informed that a lathe was put up upon which the crude block of Mantois glass for the mirror was ground. The process used for cutting the mirror shows some novel and interesting features, and is best explained by reference to our diagrams.

A cast-iron wheel, four inches in diameter, *C* (Fig. 1) was rapidly rotated by means of a driving belt, *d*, from the pulley, *W*. The wheel, *C*, was so fixed that it could be raised or lowered at will by means of a fine adjustment. Under it was placed the block of glass. This block, *M*, was firmly fixed upon the table, *N*, which could be rotated about a vertical axis by the handles, *h h*. The table, *N*, carrying the glass, could also be moved in a straight line parallel with the direction of the belt, *d*. From a reservoir, *R*, sand and water were fed upon the grinding wheel, *C*. The process adopted was as follows: The rapidly rotating wheel, *C*, was lightly applied to the glass block. While sand and water were continually fed from the tank, *R*, a slow rotary motion was given to the block by turning the handles, *h h*, the wheel, *C*, being gradually lowered as the glass wore away. In this way an annular channel was ground. The block was then moved in a straight line parallel to the belt, and outward from the pulley, so that the wheel, *C*, came nearer to the center of the mirror; thereupon another rather deeper groove was ground close to and concentric with the first. In this way the block was worked until its condition was that shown in Figs. 2 and 3 in plan and section respectively. By a similar process the ridges, *r*, left by the first operation were next reduced. After this the remaining roughness was ground away with cast iron laps ruled with a network of interlacing furrows forming squares. It is gratifying to us to hear from Father Foullety, that in this matter an article which appeared in the Scientific American Supplement (No. 582) helped to furnish the requisite information. For the polishing process the mirror was fixed upon a cask, as shown in Fig. 6, and the operator, circling slowly

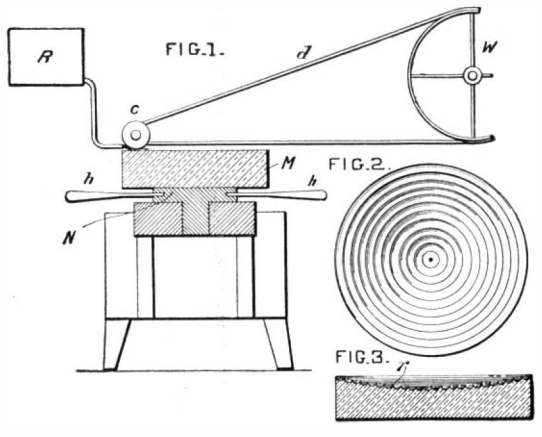

Diagram Illustrating the Method of Grinding the Lens.

and regularly around this, giving at the same time a rotating motion to the lap, worked the latter with great care over the surface of the glass, finally approximating it to a parabolic shape by polishing a little more toward the edges.

The final polish was effected with the finest emery, the lap being covered with a layer of wax half an inch thick. This delicate operation required about 50 hours' work. The whole of the grinding and polishing took some 320 hours.

The process used for silvering the mirror was that described in Troost's "Chemistry," French edition, 1884, p. 675. Four solutions are prepared.

1. 40 grammes of silver nitrate, dissolved in 1 liter of distilled water.

2. 60 grammes of ammonium nitrate, dissolved in 1 liter of distilled water.

3. 100 grammes of pure caustic potash, dissolved in 1 liter of distilled water.

4. 25 grammes of cane sugar dissolved in 250 grammes of water, inverted by boiling for ten minutes with 3 grammes of tartaric acid, then neutralized, added to 50 grammes of alcohol, and made up to 500 c. c.

The glass was thoroughly cleaned with nitric acid, then with caustic potash. Alcohol was unnecessary. It was washed in pure water and suspended with the surface to be silvered downward in the bath obtained by mixing the above solutions in equal volumes. The operation was carried on in a room kept at 80 deg. F. (27 deg. C.). The mirror was kept immersed for about ten minutes. Fig. 4 shows this operation in progress.

It next became necessary to construct the tube and the mechanism for efficiently mounting the mirror. A wooden mold was fixed by radial supports upon an iron cylinder fifteen feet long. Upon this sheets of paper were rolled, and by gluing 250 pounds of paper sheet upon sheet, an excellent tube of great rigidity and strength was obtained, which for lightness probably surpasses anything which could have been made with other material. In Fig. 5 the tube is seen in the process of its development.

The working gear was prepared at the foundries of Garth & Co. and of Belanger, both of Montreal, under the supervision and after the directions of Father Garais, who also designed all the parts and furnished the wooden models.

Our last illustration, which gives a full view of the completed telescope, shows also the mechanism by which the motion in right ascension is effected. Motion in declination is produced simply by hand, by tilting the tube about its axle.

We close with a table which will give an idea of the general dimensions of the instrument:

Diameter of mirror	20 inches.
Weight of mirror	150 pounds.
Radius of curvature	21 feet 9 inches.
Focal length	10 feet 10⅛ inches.
Aperture	4 deg. 18 min.
Length of paper tube	12 feet.
Weight of tube	350 pounds.
Total weight of instrument	1,200 pounds.

Cherrick Westbrook, Sr., the inventor of the telegraph receiver, and general superintendent of the telegraph system of the Baltimore & Ohio Railroad during the civil war, died on December 6 at his late residence in Harrisburg, Pa. He was 86 years of age.

Fig. 4.—Silvering the Mirror.

Fig. 6.—Polishing the Mirror.

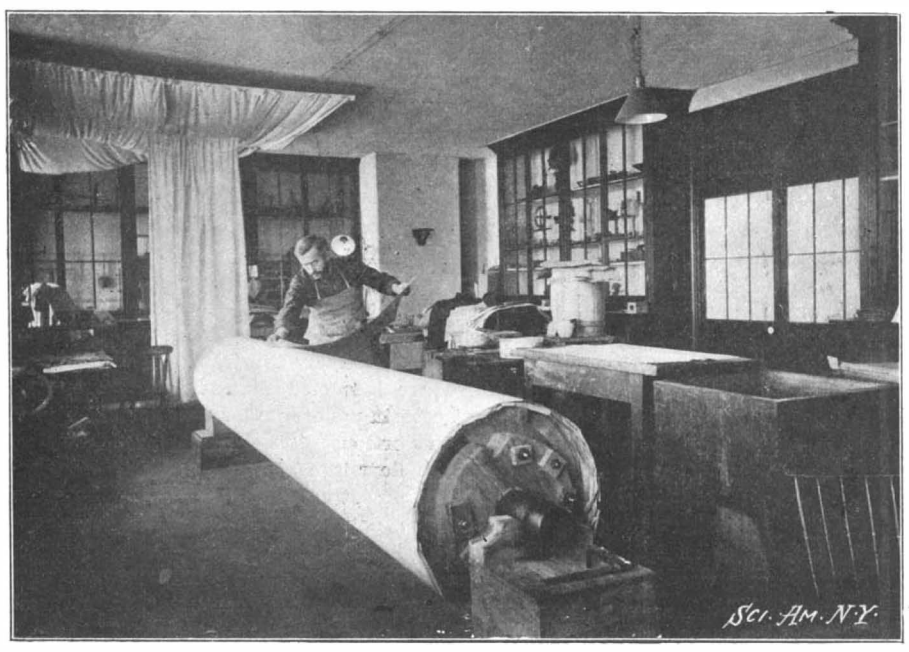

Fig. 5.—Making the Tube of Telescope.

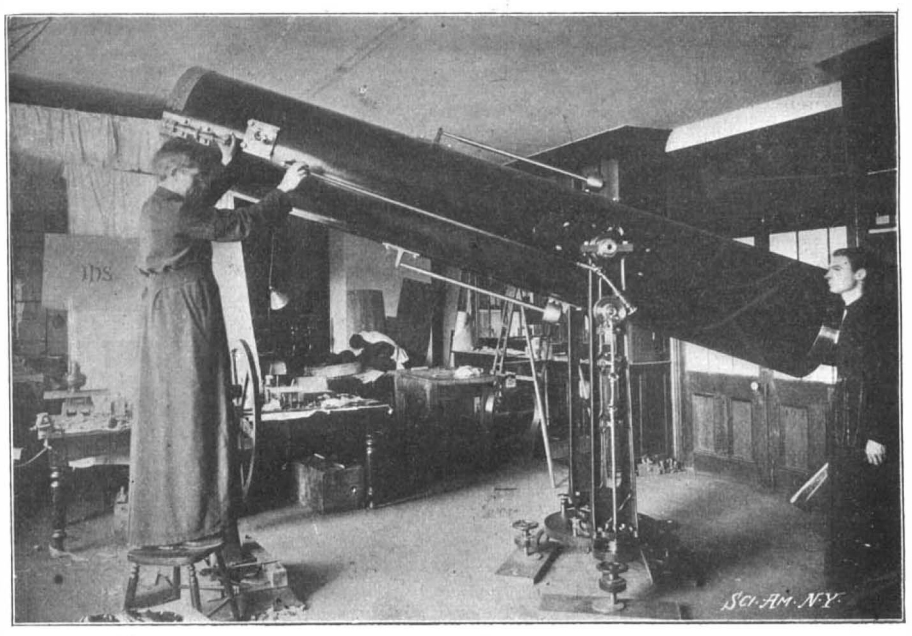

Fig. 7.—The Telescope Completed.

HOW THE LARGE TELESCOPE AT THE JESUIT COLLEGE, MONTREAL, WAS MADE.

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RAILROAD DEVELOPMENT IN CUBA.

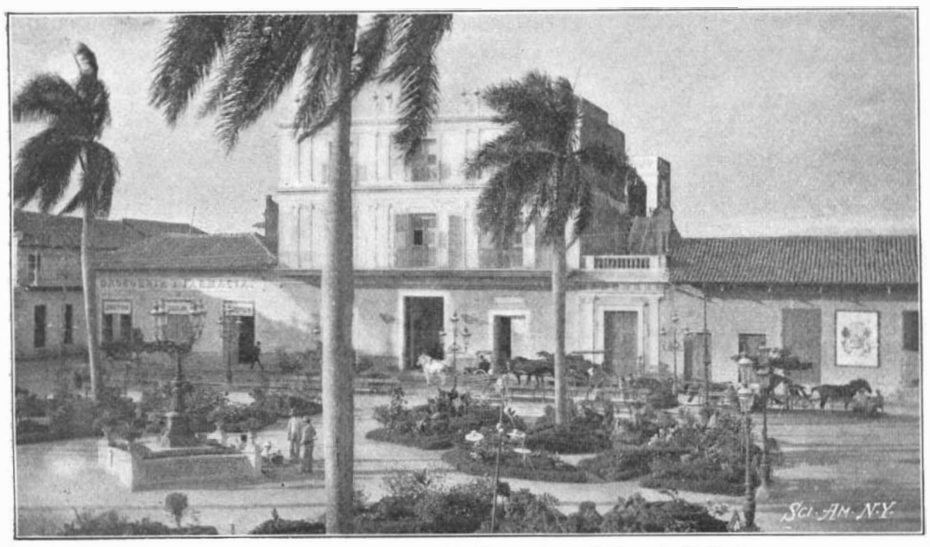
BY I. W. DAVIES.

With the opening of the new railroad, Cuba now enters upon an era of industrial development which must soon tend to ameliorate her existing political and economic condition and internal difficulties; to enhance the commercial prosperity of the country, and consequently conduce to the conciliation and betterment of the inhabitants, far more effectually and expeditiously than the wisest of legislative enactments or the most reasonable and agreeable of treaties.

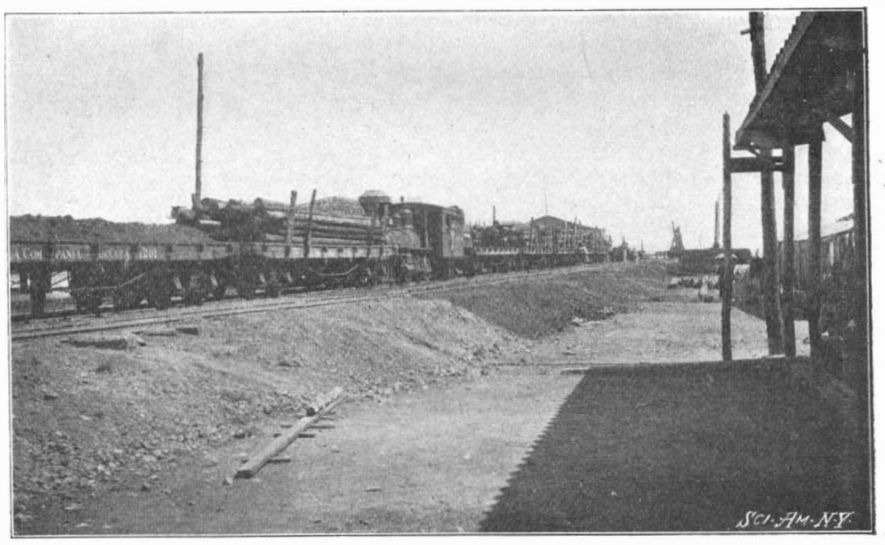
Until now barely one-half of the western portion of the island has possessed railway facilities; the eastern and larger area, running from Santa Clara to Santiago de Cuba, a distance of some 500 miles, has remained practically unexplored and undeveloped.

Immediately after the surrender of the country to the United States in 1898, the late President McKinley, with characteristic promptitude, commissioned Mr. Robert B. Porter to visit the island to make investigations and to report on her industrial, commercial, and financial condition. In dealing with the question of railway communications there, Mr. Porter reported:

"The railway system of Cuba, consisting of seven companies, the aggregate length of whose lines is only 917 miles, is entirely inadequate in bringing the extreme ends of the island together, Santiago and Havana in point of time being as far apart as San Francisco and New York, though only separated by a distance of a few hundred miles. The facts gathered on this subject point to the advisability of immediately constructing a trunk railway from end to end of the island, witn branches extending north and south to the important cities and ports. From whatever standpoint it may be viewed, no one enterprise could do so much to improve the situation on the island. No revolution

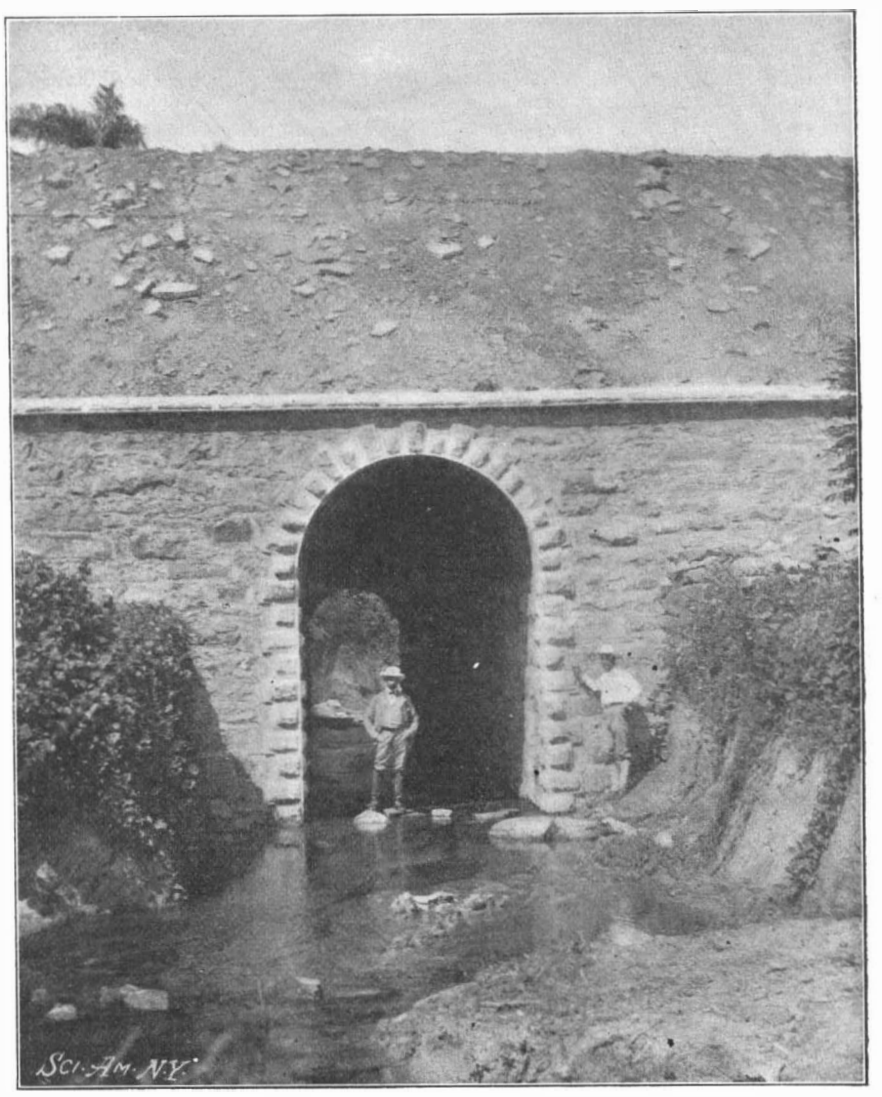


The Company's Temporary Headquarters at Puerto Principe.

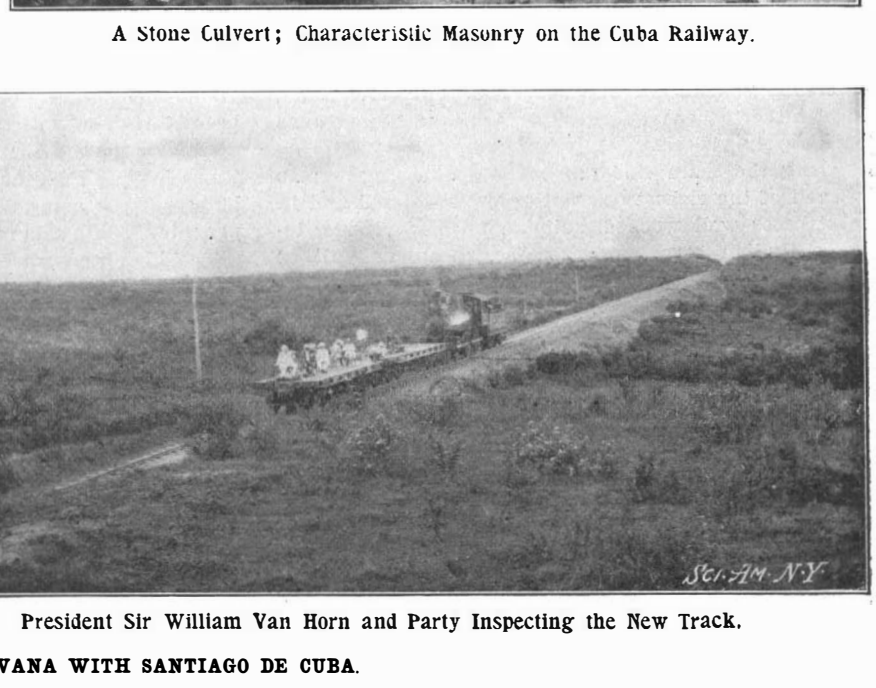


A Work Train.

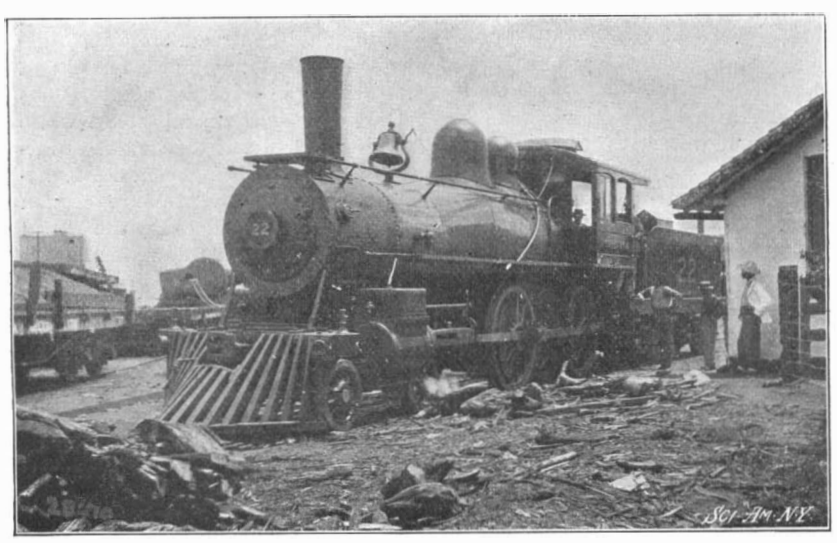
Right-of-Way Cleared and Grading Under Way.



A Deep Cut on the New Railroad.



A Stone Culvert; Characteristic Masonry on the Cuba Railway.



Modern Locomotive of the Type That Will be Used on the New Road.

President Sir William Van Horn and Party Inspecting the New Track.

NEW RAILROAD IN CUBA CONNECTING HAVANA WITH SANTIAGO DE CUBA.

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could have existed in Cuba if such a railroad had been completed by the former government, and nothing will so rapidly tend to the revival of commerce and general business as the facility for quick passage from one end of the island to the other, and from the trunk line over branches to the seaboard cities. All political turbulence will be quieted thereby and prevented in the future. The entire country will be open to commerce, lands now practically of no value and unproductive will be worked, the seaport towns will become active, and commerce between the island and the United States will soon be restored to the former figures. . . . After a careful study of the situation, it would seem extremely doubtful if such an enterprise could be made a commercial success for many years to come."

The ominous, though honest, warning contained in the concluding sentence of this report certainly tended to defer rather than encourage any prompt measures being adopted, either by the government or a body of capitalists, to provide Cuba with what she most urgently needed for her present and future welfare, as well as for the ultimate benefit of the United States. With wonted alacrity, however, and regardless of any immediate prospect of commercial reward, Sir William Van Horn got together a well-chosen company of American and British gentlemen interested in railways, and without loss of time a body of competent men were dispatched to Cuba to make a thorough survey of that large portion of the island to which Mr. Porter had referred as being so much in want of railway facilities, and with equal promptness the Cuba company decided to at once undertake the enterprise at all hazards. The result is that in less than two and a half years the whole work has just been completed most successfully and satisfactorily, and to-day Cuba enjoys a through line of railway communication from one end of the island to the other, running through the very heart of the country.

There are also several branch lines—some in course of construction, and others in contemplation. The most important branches soon to be opened are those running across the island, connecting Santiago de Cuba with the Bay of Nipe and Jugaro with San Fernando, and two smaller lines forming a connection with Sancto Espiritu at one end of the trunk line and Holguin at the other.

The railroad is of standard gage, and its bridges are of steel and masonry; its equipment will be similar to that of the best American railways, and it is intended to run through sleeping cars between Havana and Santiago de Cuba—a distance of nearly 900 miles.

THE RECENTLY COMPLETED RAILROAD THROUGH THE ISLAND OF CUBA.

The main object of this new railroad is stated to be "the development of the eastern and larger part of the island of Cuba, by establishing direct rail connections between Havana, Sancto Espirito, Puerto Principe and Santiago de Cuba and to open up a vast extent of new and attractive country for settlement and cultivation." The new line will also add largely to the attractions Cuba offers to tourists, for it will make many important and interesting places and districts easily accessible which have hitherto been difficult to reach, and which have been rarely visited.

Along the main line are to be found great areas of land of the richest description, well watered and in most cases well wooded, suitable for sugar cane, tobacco, Indian corn, cotton, coffee, cacao, and all of the fruits of the tropical and sub-tropical regions. Other districts are peculiarly adapted to cattle; indeed, cattle do well everywhere, for the grasses are luxuriant and highly nutritious, and there is usually an abundance of water. Around the coast are to be found many excellent harbors, and it is reported and believed that the unexplored part of the island contains much hidden mineral wealth.

The interior, which is sparsely populated, is comparatively level, and largely covered with hardwood timber, and while the soil of the different districts is generally of extraordinary fertility, some places are more desirable than others, both in this respect and in regard to healthfulness. On the whole, the climate is for the tropics, a tolerable one, and the island will soon be rendered more healthy by foreign irrigation, drainage, and an improved system of sanitation. The northern employes of the Cuba company have as a rule been free from illness of any kind, notwithstanding their employment on railway construction under conditions not always favorable to health. Unlike many of the West India islands, Cuba is entirely free from poisonous reptiles, and has fewer mosquito and similar pests than any other southern regions.

There are no obtainable government lands in Cuba; practically all of the lands are held by individuals, and in the eastern half of the island they are usually held in large areas. No systematic land survey has yet been made, and the large tracts are mostly in irregular forms and their boundaries are difficult to define and trace; land titles in the unoccupied and in the newly settled parts of Cuba are in many cases defective and need strict investigation, though the government has recently taken steps toward the perfection of titles.

Not the least important and remarkable feature in connection with this modern Cuban railway enterprise is the combination of American and British interests and influences. The international infusion is in happy consonance with similar existing vested interests on the island, and has already produced unmistakable evidence of a very promising future for Cuba, commercially, politically, socially, and generally.

Stationary Fire Pumps.

BY GEORGE J. JONES.

There has just been installed in the city of Philadelphia an advanced type of fire-fighting system which seems to indicate that the fire engine as we know it today will soon be retired from service to a very great extent, the necessary water pressure being secured from a large stationary pumping plant. Some of the advantages claimed for the system are the following: In the first place, it offers, for fire purposes, a stream of water which is almost instantly available, and which has more volume and can be thrown higher than that delivered by any fire engine yet in operation. It avoids the possible delay which may occur in getting a fire engine to the scene of the conflagration and into service, to say nothing of the elimination of the element of danger, always present when these heavy vehicles are driven rapidly through the streets of the crowded portions of a large city.

The plant laid down in Philadelphia covers the more congested part of the business section. At present the pumping is done temporarily by one of the fire boats moored at a wharf in the Delaware River, or by all of them, as the occasion may demand. Work has been started on a permanent pumping plant at the foot of Race Street, which, when completed, will be at all times in readiness for instant operation. Then it will be possible to pump fourteen hundred gallons of water per minute into a burning building.

The high-pressure system consists of a gridiron arrangement of piping entirely independent of the ordinary water supply, although a connection, fitted with a check valve, is maintained between the two plants for the purpose of keeping the pipes primed constantly and ready for instant service. The pressure amounts to from seventy to eighty pounds at the hydrants. A telephone system, with call boxes located in the vicinity of each hydrant, comprises a feature of the new plant; and immediately upon the receipt of an order for water, the pumps at the water's edge will be started, and, since the pipes are kept filled by the regular water system, the pressure is available at once, so that no time is lost in getting a deluge into the burning building. Under the existing arrangement, with the fire boats doing the work, there is never a delay of more than five minutes, which is inconsiderable when compared with that of getting apparatus to a fire and into service under ordinary circumstances. When the new pumping plant has been put into operation, this delay will be reduced to a few seconds. There are three points along the river front where connections with the system may be made by the fire boats; and one of these three craft maintained by the city in the Delaware River, will be at all times connected and ready for work, until the permanent plant is in operating order, which will be about June next.

The installation consists of four principal mains laid along Market, Arch, Race, and Walnut Streets, from the Delaware River to Broad Street, the gridiron being formed by cross connections on Second, Fifth, Eighth, Eleventh, and Broad Streets. The pipe is of especially constructed, tough, gray cast iron. The principal main, on Market Street, is 16 inches in diameter, while that on Race, Walnut, and Arch Streets is 12 inches. The diameter of the cross connecting pipes is 8 inches. The thickness of the pipe ranges from ⅞ to 1½ inches. The joints are flanged and securely bolted together, and other precautions have been taken to make them as strong as possible, in order to withstand the great strain to which they will be put. Heavy cast iron sleeves, or sockets, are provided at intervals in the pipe system, to allow for the contraction and expansion of the metal. Crosses have been put in at the principal street intersections, to meet any further demand for extension. There are 139 especially constructed hydrants on the system, each with two outlets for 3½-inch hose. The hydrants are of the heavy post pattern with 6-inch inlets and 4-inch outlets. The couplings in use are what are known as the "Siamese," with which it is possible to make six connections at one time.

The new system was recently subjected to a severe test by the members of the Fire Underwriters' Association. The trial took place on Broad Street, at a point which is about 8,000 feet from the pumps. The most satisfactory results were secured, although it was impossible, under the existing circumstances, to test the pipes to their full capacity. After being laid, each section of the pipe used was subjected to a pressure of 400 pounds, and with the stationary plant in operation, it is expected that the pressure will almost reach that point; but at the test, with the combined efforts of the three fire boats, the pressure on the pipes was less than half that figure. However, the work done at the test and at subsequent fires has demonstrated that this kind of a service is far superior to anything which could be secured with the use of portable fire engines. At one time there were twelve streams of water issuing from two hydrants, the water being hurled a distance of 175 feet through a 300-foot section of hose. The hose used was 2½ inches in diameter and had a 1¼-inch nozzle. A single stream, with a 3½-inch hose and a 2-inch nozzle, was thrown a distance of 262 feet in a horizontal direction, the nozzle being held at an angle of about 30 degrees. With two streams, the distance was decreased to only 258 feet. A single stream thrown in a vertical direction reached to within a dozen feet of the top of the North American building, in front of which the test was conducted. The roof of this structure is 255 feet above the pavement, and it is the tallest building in the city. A stream from the high-pressure system was sent aloft beside one from one of the most powerful fire engines owned by the city. The stream from the latter reached the ninth story, while that from the high-pressure hydrant touched the nineteenth. While these tests were being conducted, hydrants in distant parts of the high-pressure section were opened, in order to note the effect on the Broad Street streams, but the decrease in the flow was hardly appreciable.

As a result of the successful demonstration of the high-pressure service, the insurance rates in the portion of the city thus protected were at once lowered, and it is possible that a further reduction will be made.

The system was installed by the Hoffman Engineering and Contracting Company, of Philadelphia. The use of gas engines in the permanent pumping plant is one of the notable features of the installation. These engines, of 300 horse power each, are now being built by the Westinghouse Company.

The computation of the figures for the steam plant must take into consideration the coal consumption for the entire month, with steam pressure on the boilers all the time; but this calculation contemplates only about ten hours of actual service per month. This would cost $50 per hour. The gas plant will require gas for the time of the run only, as when the engines are idle there is no consumption of gas; and, on a

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basis of ten hours pumping per month, the gas plant would cost $39.20 per hour. The services of nine men are required for the steam plant, while six are sufficient for the gas plant. Chief Hand says that in actual practice the economies of the gas plant will be even greater, for it will very rarely happen that the entire plant will be in operation ten full hours each month.

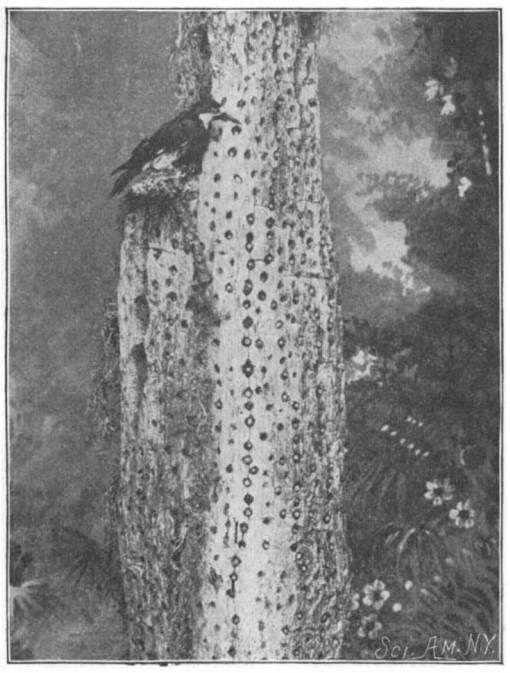
QUEER CAPRICE OF CALIFORNIA WOODPECKERS.

BY M. C. FREDERICK.

For bees to establish themselves beneath the roof or over a window in a dwelling occupied by a human family, is not rare; but it is seldom that woodpeckers follow their example and choose a residence for a storehouse.

The region of Santa Barbara was once well wooded with fine live-oaks, the headquarters of large numbers of woodpeckers. Their incessant noisy hammering from daylight till dark as they cut holes in the trunks of the trees and fitted in the acorns, their sharp calls, and the frequent flashes of brilliant red, white, and blue-black, as they flitted from branch to branch, gave a certain gala atmosphere to the woods and added much to their charm.

Montecito Valley, contiguous to Santa Barbara and



WOODPECKER'S TREE-TRUNK STOREHOUSE FOR ACORNS.

the home of most of her wealthy residents, still retains many of these old oaks, often the chief feature of landscape gardens widely noted for their beauty. A fairly large number of woodpeckers continue to ply their vocation with unabated energy. Why they should prefer a residence in the midst of one of these groves, for a granary, instead of the regulation tree trunk, is a mystery. Perhaps they discovered that redwood is more easily worked than oak or sycamore, or perhaps it was the labor-saving feature that appealed to their thrift, since, instead of a separate hole for each acorn, a single hole answered for many acorns.

Whatever the reason of their curious choice, they have so thoroughly drilled the wood of the building as to cause serious damage and necessitate extensive repairs.

The cornice, or strip of molding that finishes the under edge of the roof, known as the crown molding, has most attracted their fancy, inclosing as it does a small triangular space back of it, extending entirely around the roof. One can well imagine the surprise of the first industrious little cabinetmaker who, having chiseled out a cavity of the proper size, was driving his acorn into place, when it suddenly disappeared.

A second acorn tried in the same place meeting the same mysterious fate, his unconquerable persistency doubtless led him to try again and again, in the hope of unraveling the mystery until, the immediate space being filled, he at last comprehended the situation and delightfully adopted the new method instead of the old. Anyway, the woodpeckers have made holes at convenient intervals, and literally crammed the space to overflowing. In some instances the molding is sprung half an inch or more from its place, the tightly packed acorns protruding through the cracks.

The holes are usually made in the upper edge of the molding, next the shingles, the shrinkage of the wood having evidently left a slight opening which facilitated their labors; but holes have also been made directly through the cornice, as the illustration shows. The shower of acorns that fell to the floor when the molding from the roof over a corner of the balcony was removed is also shown.

The [illegible] adventurers by no means confined themselves [illegible] the cornice. The sides of the upper story being shingled, they have made a number of perforations down the corners and elsewhere, and in the middle of a gable is an opening large enough to admit the birds themselves. Whether they found the interior to their liking, and nested there, is not known, since there is no way of entering the attic to see. It is believed, however, that there are bushels of acorns stored away in various parts of the building.

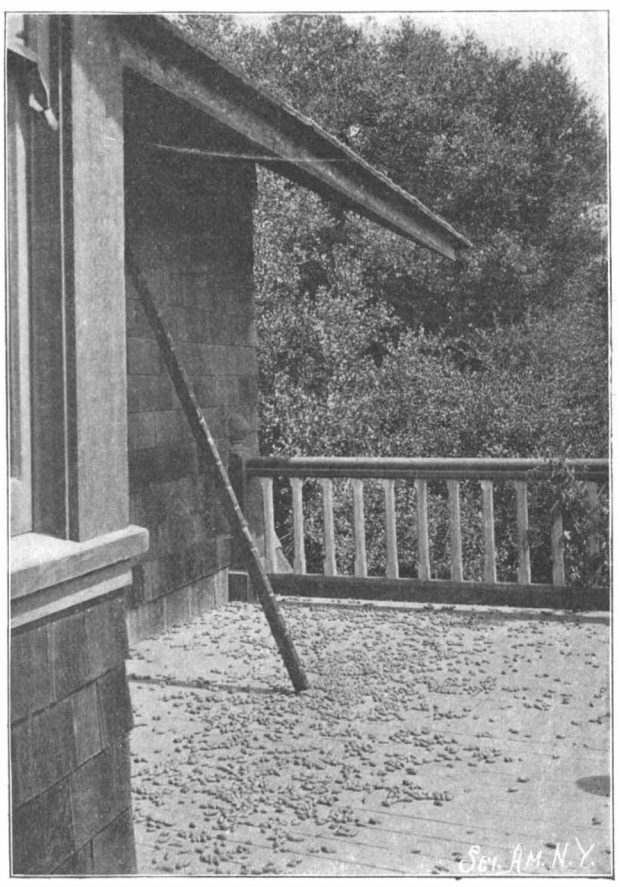
Other houses in the same locality have been attacked by the birds—in one instance they made holes along the comb of the roof, plugging them up with acorns; but in no other case have the depredations approached this in magnitude. If any one appeared while a woodpecker was at work, he would stop for a few moments, eye the intruder saucily as if trying to divine his intentions, and then go on hammering as unconcernedly as if no one were watching.

Automobile News.

Henri Fournier, the noted French automobilist, arrived in New York last week, bringing with him five French machines to sell to wealthy Americans. Two of these automobiles are 9 horse power Renault cars, one of which is patterned after an English cab and the other after a landaulet; the third is a 40 horse power Mercedes of double phaeton pattern, with entrance in front, King of the Belgians seats, and finished in pearl gray; the fourth is an 18 horse power Mors, with a very low frame, triple phaeton body, and seating room for seven; and the fifth is the most novel of all, being a Lohner-Porsche, 28 horse power, gasoline-electric tonneau car, with electric motors in the hubs of the front wheels, which also steer the machine. A gasoline motor direct-connected with a dynamo furnishes power for generating electricity to run the car, any superfluous current being sent into a storage battery, which supplies extra power as it is needed. The car is said to have 14 different speeds, the maximum of which is 48 miles per hour. This system has been so successful that the Panhard Company has purchased the patents and is making machines.

When questioned regarding his new 120 horse power racer, Fournier said: "It is short in front, like a fish's head, and then long, like its tail. After you break the air, it rushes in behind and pushes you; so you must have the car short in front and long behind. The seat is just a bicycle saddle on the rear axle. It will have four speeds and drive direct on the highest. What will it do? Oh! 32, 33, or 34 seconds to the mile."

In regard to the 1,600-kilometer (993.6 mile) Paris-Madrid race of next summer, Fournier stated that Mors machines are being built for W. K. Vanderbilt, Jr., and D. Wolf Bishop to drive in it. He gave it as his opinion that in all probability the International Cup race would be over the first day's stage of this race, i. e., from Paris to Bordeaux, a distance of 585 kilometers (362.28 miles). The German entries in the cup race consist of two 100 horse power Mercedes ma-

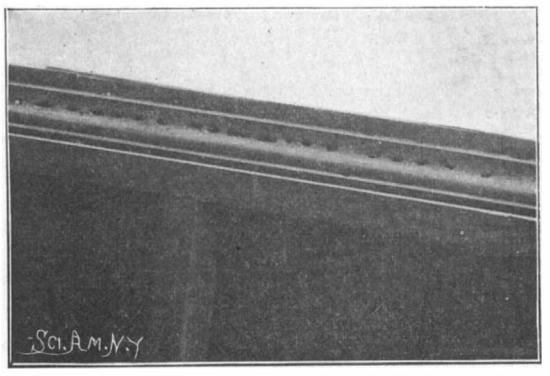


ACORNS REVEALED BY THE REMOVAL OF A CORNICE.

chines, to be driven by Baron de Caters and Camille Jenatzy; Fournier and the Farman brothers will represent the French, the latter driving Panhard machines; S. F. Edge and Charles Jarrott will mount English Napier cars; and Alexander Winton, with two other of his countrymen, will run American machines. While on the subject of racing, Fournier said that he would like to have a track race with Mr. Winton or Barney Oldfield, who drives the Ford racer, for any distance they might name; and that if such a contest could be arranged, he would bring over his new cup racer for it.

The Daimler Company, of Cannstadt, Germany, have brought out a new 60 horse power model of their popular Mercedes car, in which the frame is hung lower than usual, and which has a novelty in the shape of an electrically-manipulated change-speed lever that enables the operator to effect a change of speed by merely pressing a button. This improvement is a great one, as the changing of gears is an operation that requires considerable skill to perform properly on most of the large gasoline cars.

The New York Automobile Show closes its doors on January 24. Some of the novelties that were exhibited there we shall describe in our next issue and in a special Automobile Number, to be published the middle of next month. Most of the manufacturers



HOLES DRILLED BY WOODPECKERS THROUGH A CROWN-MOLDING.

of steam and electric carriages have added gasoline automobiles to their list of cars, and the gasoline machines are becoming more widely used than ever. Those with air-cooled motors are more numerous than heretofore, and the tendency is to simplify all parts of motors and machines as much as possible. Several cars propelled by two-cycle gasoline engines were an example of simplicity aimed at in engine construction, while the planetary transmission gear mounted on the engine shaft, as used on many of the runabouts, is without doubt the simplest and most compact form of transmission gear. Three-speed transmissions are used on many of the heavy cars, sliding gears being used for the purpose in most cases, and individual clutches, with gears always in mesh, being employed in a few instances. Wood wheels with detachable double-tube tires have taken the place of wire wheels and single-tube tires; and almost all parts are made stronger, in order to stand hard use on bad roads.

The North-Eastern Railroad of Great Britain, a portion of which is to be converted to electric traction, proposes to carry out a series of experiments with petrol auto-cars to be used upon the 37 miles of track near the section to be electrified at Newcastle-on-Tyne. An order has been placed with a motor power company in London for the supply of a number of large four-cylinder petrol engines to develop 100 horse power each. It is intended to employ these engines for the haulage of light and frequent trains on local branches. The petrol cars which have been ordered for this purpose have done excellent work on common roads, and it is anticipated that they will achieve even better results on the specially constructed track of a railroad The advantage of this innovation in railroad traffic is that it will not necessitate any alterations of the track, such as the laying of the third current rail with its complications at crossovers and junctions.

Chief Engineer Melville Retires.

On January 10 Rear-Admiral George W. Melville, Chief of the Bureau of Steam Engineering, was placed on the retired list of the navy, having reached the age limit of sixty-two years. By special authority of Congress, he is to continue his service at the head of the Bureau until August 9, 1903. Admiral Melville was appointed to the navy from New York in July, 1861.

New Use for Formaline.

At the last annual meeting of the Obstetrical Society, Dr. Charles C. Barrows read a paper in which he presented the results of his use of formaline as a cure for sepsis or blood poisoning. Formaline has been used as an antiseptic, but the use to which Dr. Barrows has put it is probably new. Further experiments will be watched with interest.

Motorman John G. Flynn, of Bridgeport, Conn., is the inventor of an insulated switch iron which will save the motorman from getting many shocks while working around his car.

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RECENTLY PATENTED INVENTIONS.

Agricultural Implements.

AGRICULTURAL IMPLEMENT.—D. LUBIN, New York, N. Y. A manually-operated device is provided by this invention for digging and cultivating ground. The device may be easily operated by one person and may be used to throw up comparatively large slices of earth and finely pulverize them before being again deposited on the ground. Thus with one machine the ground is prepared for seeding or planting.

POWER OPERATED AGRICULTURAL MACHINE.—D. LUBIN, New York, N. Y. This invention relates to improvements in machines for the fine tillage or cultivation of ground, an object being to provide in connection a motor-driven vehicle and an agricultural tool, the mechanisms being so arranged as to alternately move the vehicle and draw the tool along the ground; that is, to move the vehicle a prescribed distance while the tool remains still and then draw the tool up to the vehicle while the vehicle is stationary. By this division of work it is possible to employ a motor of comparatively low power.

Engineering Improvements.

FLUID-PRESSURE SPEEDING DEVICE.—J. WIECHMANN, Albany, N. Y. Mr. Wiechmann has invented a device nominally employing fluid pressure and used as a transmission gear from a driving shaft to a driven shaft, the relative speeds of which are controllable at will. The speed of the driven shaft may be gradually reduced as compared with the speed of the driving shaft and the speed of the driven shaft may be in the same direction as that of the driving shaft, or in the opposite direction.

PUMP.—W. S. MCROBERTS, Findlay, Ohio. This invention relates particularly to pumps for removing sand from oil wells, the object being to provide a pump of simple construction that may be readily inserted or removed from the well. The device is so arranged that it may be cleaned or emptied of sand without inverting it.

Lighting, Heating and Ventilating Apparatus.

BOSH-PLATE FOR BLAST-FURNACES.—J. C. MCCAUSLAND, Pittsburg, Pa. The invention provides improvements in that class of devices employed for cooling the walls of blast furnaces which are known in the art as "bosh-plates." The object of the invention is the production of a simple device which serves to secure a good circulation of water around the "nose" or inner end of the plate and the uniform diffusion of the water over the upper and lower surfaces of the plate to the end that the plate cannot become cracked or broken nor can sediment accumulate therein.

GAS-SAVING ATTACHMENT.—P. RIESS and C. LANGE, New Orleans, La. The purpose of this invention is to provide a device adapted for use in any system of piping whereby to economize in the use of gas for heating, lighting, and cooking purposes, and to so construct the device that it may be readily and conveniently applied at a burner or at any point in the system of piping between the motor and the point where the gas is to be consumed.

ACETYLENE-GAS GENERATOR.—G. E. LA CELL, Lakota, N. D. This generator is so arranged that gas cannot escape through the ignorance or carelessness of attendants, nor can the apparatus be wrecked by explosion at or subsequent to the operation of recharging the generator. The generator is removable bodily and in a sealed condition from its tank, so that it may be carried out of doors, emptied, cleaned, and recharged without permitting the escape of odor into the room.

VENTILATING-FAN.—W. BURROWS, Thurmond, W. Va. The object of this invention is to provide an improved fan for ventilating mines. The blower and the casing within which it rotates are tapered. When used in a mine the reduced or open end of the casing is located at the drift-opening and the exit-pipe extended to a point where foul or impure air may be delivered. The increasing inner space in the casing from its inlet permits expansion of the air and consequently a more rapid discharge through the exit-pipe.

STEAM HEATING APPARATUS.—A. P. BROOMELL, York, Pa. The present invention covers certain improvements in steam heating apparatus for which Letters Patent were previously granted to Mr. Broomell. The improvements herein provided are designed to afford a simpler, more practical and more efficient construction of receiver which receives the water of condensation from the radiator to the building and any air that accompanies it, sending the air out into the atmosphere and returning the water to the boiler.

VENTILATING-STOVE.—F. R. SHAFER, Burlington, Wash. Mr. Shafer's invention relates to sheet or cast iron stoves, by means of which fresh, cold air from outside of the building to be heated and ventilated is made to pass between an inner heated stove and an outer jacket and thence discharge into the room, after which, as the warm air cools and settles to the floor, it is taken from the room by way of the stovepipe.

Mechanical Devices.

EXCAVATING-MACHINE.—C. C. MCBRIDE, California. Owing to certain improvements provided by this invention Mr. McBride's excavating-machine may be used to good advantage in many different kinds of work, such, for instance, as railway grading and cutting through banks, for narrow and deep cuts where cumbrous machines are unavailable, for mining work, and in all places where excavation of a bank of opposing material is necessary.

SPEED-INDICATOR-OPERATING MEANS.—C. E. KELLY, Anderson, Ind. Means for operating a speed-indicator are provided in this invention. It may be used for indicating the distance traveled by a vehicle in a stated time, or it may be fitted to show the number of revolutions per minute of a turning part. The operating means consists of a series of steel balls which are driven radially by centrifugal force, actuating levers which communicate the motion to the indicating device.

OPERATING MEANS FOR SPEED-INDICATORS.—C. E. KELLY, Anderson, Ind. This invention relates more particularly to a means for transmitting movement to a speed-indicating device, such, for example, as that described above. The device comprises means for regulating a spring tension so as to register accurately the number of miles a vehicle has traveled, or the number of rotations a rotating part has made.

FRICTION-CLUTCH.—M. PIVERT, New Orleans, La. The object of this invention is to provide an improved friction clutch which is of simple construction and effective in operation to transmit power from a motor to the driven parts. The arrangement is such as to permit the operator to readily disconnect the driven clutch member from the driving clutch member.

WINDMILL.—J. G. BENSTER, Moline, Ill. The improved windmill provided by this invention is arranged to insure a direct and full transmission of the power developed in the wheel. An improved means is provided for shifting the vane to throw the wheel out of the wind. The construction of the wheel is such that in case a wing breaks it can be readily replaced by a new one without taking the rest of the wheel apart.

REGISTER.—J. H. WARNER, Westplains, Mo. Mr. Warner's invention is an improvement in registers used in connection with a cigar-cutter whereby to register the number of cigars cut. The construction is such that the cigarmaker as he cuts the ends of each cigar operates the register, so that he can, at a glance, determine the number of cigars made, whether the same are made by hand, in bunching means or otherwise, the register keeping account of the number of cigars cut.

COPY-HOLDER.—C. B. TOWERS, Miles City, and W. A. CAMERON, Stacey, Mont. The invention provides a means for indicating to a stenographer a particular line of manuscript from which the copy is being taken. It provides means for automatically operating an indicator by the typewriting machine, or for manually operating it by means of a crank. Automatic means are also employed for returning the indicator to the top of the copy-holder on which it is located, thereby saving the time and labor of the stenographer using the invention.

MACHINE FOR CUTTING, EXPANDING, AND BEADING TUBES OR FLUES.—J. CARMICHAEL, Franklin, Wash. The construction of this machine is such that it may be readily applied and fastened in position on a boiler and conveniently operated to permit of cutting a tube to the proper length for beading, or to cut an old tube for removal from a boiler. The machine will expand the flue for setting it firmly in a tube sheet, and will bead the end of the tube to securely hold the same in position in the boiler.

TILT-HAMMER.—B. C., A. M., and J. M. SCHRODER, Osmond, Neb. These inventors have provided an improved tilt hammer of simple construction which is very effective in operation and arranged to permit of quickly varying the stroke of the hammer according to the nature of the work under treatment. The hammer may be used in any desired position within a vessel or other places.

BEATING-ENGINE.—E. A. JONES, Pittsfield, Mass. The present invention, which is an improvement on one previously patented by Mr. Jones, is arranged to insure a proper circulation of the pulp or stock when the vat is being emptied, and it dispenses entirely with the manually-wielded rakes now usually employed for moving the pulp through the discharge pipe.

OLIVE CRUSHER AND PITTER.—W. L. MORRIS and E. D. SMITH, Woodland, Cal. The purpose of this invention is to provide means for separating the stones or pits from olives, so that oil may be made from the pure olive pulp, and, if desired, a second class of oil may be made from the pits and such pulp as may cling thereto after the separation.

GUN-CARRIAGE.—P. DE NORDENFELT and E. TERNSTRÖM, 8 Rue Auber, Paris, France. In this improved carriage the slideway which supports the gun is movable in that which concerns both the gun and the cradle. The gun is mounted to slide in an intermediate slide, the latter being also movable in the same direction on a guideway integral with the cradle, so that in the false position taken by the gun when recoiling, the latter is supported both by the slideway and cradle which thus properly sustain and guide the same in its long recoil.

WIND-WHEEL.—J. F. HOAG and C. R. BECKMAN, Palisade, Neb. The present invention is in the nature of an improvement in wind-wheels by which the stroke of the pump is lengthened as the wind increases, so as to cause the work done to be increased in proportion as the power of the wind increases without increasing the speed of the wheel to an undesirable velocity.

MEANS FOR CONVEYING OIL FOR CALMING WAVES.—C. LA F. HILLMAN, Santiago, Chile. Means are hereby provided for quieting the surfaces of bodies of water whereby protection is afforded to ships or boats of any size, by they at sea or anchored, also to jetties, quays, and landings. The invention is based on the well-known action of the film of oily liquids, which not only impedes the formation of and ascent or detachment from the surface of spray to be driven by the wind, but also impedes the detachment of larger bodies and masses of water.

Railway Improvements.

AUTOMATIC RAILROAD-CAR BRAKE.—G. W. STOCKIN, Mobile, Ala. This railroad car brake is automatically controlled by the movement of the locomotive. When the train is running the brake shoes are off the rim of the brake wheels, and when it is desired to brake the train the engineer reduces the speed of the locomotive, causing a rearward, sliding movement of the brake rod under the cars, which operates the brakes, thus the momentum of the cars is utilized to apply the brakes to bring the train to a standstill, if desired, or to brake it sufficiently to run down a grade at the desired normal speed.

Vehicles and Their Accessories.

TRACTION-WHEEL.—R. L. DUTCHER, Stites, Idaho. The tread of this traction wheel is provided centrally with an annular swell terminating in an annular rib. The mud cleats project radially outward a little beyond the outer edge of the annular rib and at right angles to the same. This enables the cleats to bite slightly into the ground and at the same time to allow the annular rib to act as the outer surface of any wheel normally acts where the ground is tolerably hard.

SLEIGH-KNEE.—M. CREIGHTON, Rensselaer Falls, N. Y. In the present invention the object is to provide a pressed-steel knee which can be manufactured by machinery at very low cost. The improved knee possesses great strength with a minimum of weight, so that it will not collapse under weight and strain, and at the same time, does not appreciably increase the weight of the structure.

BRAKE MECHANISM.—W. H. SMITH, Pawtucket, R. I. An improved brake mechanism is hereby provided which is of a simple and durable construction, very effective in operation, and easily manipulated. It is arranged to permit of being set to any desired degree of resistance according to the use made of the car or machine on which the brake mechanism is applied.

LUBRICATING DEVICE FOR VEHICLE-WHEELS.—W. F. PROBST, Chillicothe, Ohio. Mr. Probst provides by this invention a novel device for lubricating vehicle wheels. The construction is compactly arranged and designed so as to not materially widen the wheel. The parts are so connected as to firmly brace the wheel when assembled for use.

DUMPING-VEHICLE.—C. H. SMITH, Greeley, Colo. The body of this dumping vehicle is so arranged as to dump simultaneously at both sides of the vehicle or at one side at a time. The invention is of such character that it may be attached to a wagon, cart, railroad car, mine car, or vessel.

Miscellaneous.

ILLUSION APPARATUS.—A. W. BOORAEM and F. T. HOWARD, Brooklyn, N. Y. Two patents are granted to these inventors under this heading. The object of the first invention is to produce in the minds of passengers the illusory sensation that the vehicle, upon which the passengers are carried, breaks through ice, or through some medium analogous thereto, and continuous to run upon a comparatively submarine way.

The second invention is designed more particularly to produce illusions in the minds of passengers riding upon a sporting way such as a pleasure railway or pleasure canal.

NON-REFILLABLE BOTTLE.—J. C. BEITLER, Lancaster, Ohio. This invention has for its object the provision of a non-refillable bottle, parts of which are so constructed and correlated that they cannot easily be injured or deranged by tampering or by accident. A further object of the invention is to provide a device whereby when an attempt is made to exhaust air from the passageway the bottle will be closed.

NOTE.—Copies of any of these patents will be furnished by Munn & Co. for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

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Inquiry No. 3724.—For makers of pressed articles made from paper pulp.

Inquiry No. 3725.—For outfits for manufacturing rubber stamps, and supplies for the same

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January 13, 1903,

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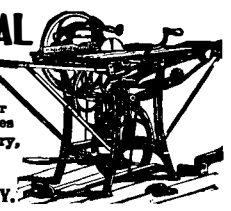

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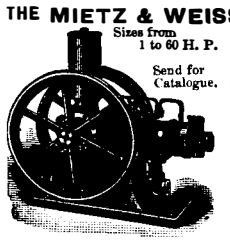

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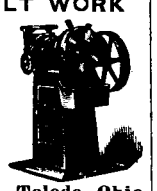

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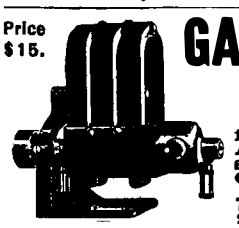

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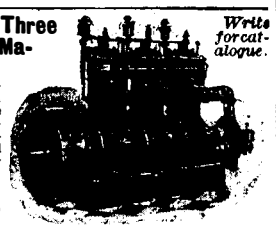

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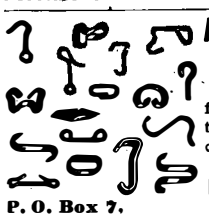

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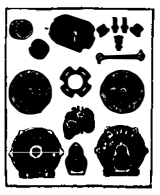

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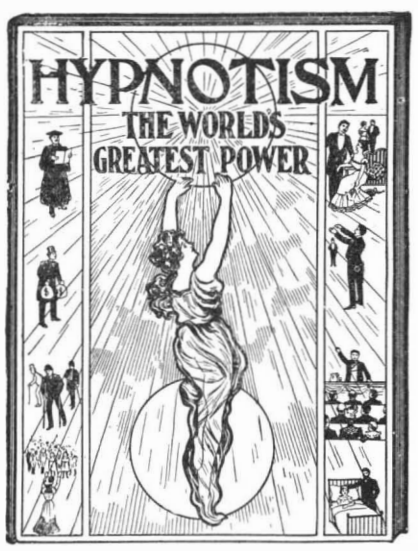

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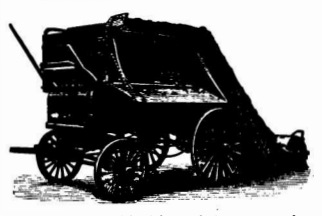

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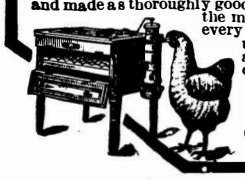

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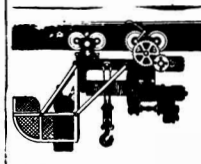

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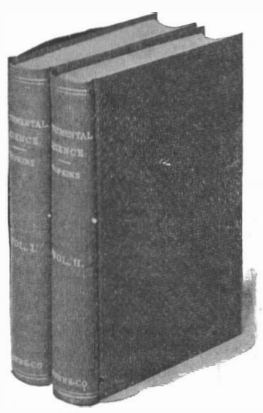

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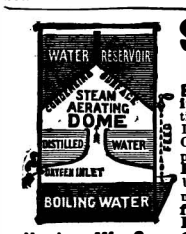

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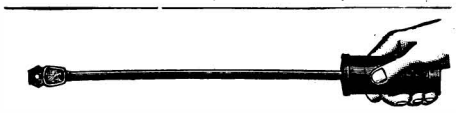

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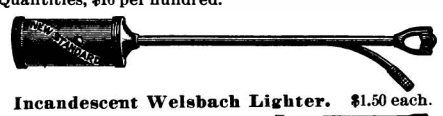

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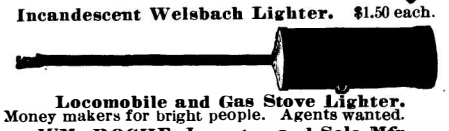

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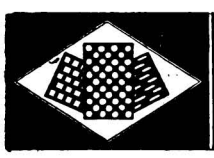

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SCREW PROPELLER COMPUTER. By George R. McDermott. Ithaca, N. Y.: Taylor & Carpenter. Price $5.

From Messrs. Taylor & Carpenter, of Ithaca, N. Y., we have received a most useful work by George R. McDermott, Professor of Naval Architecture at Cornell University, describing his screw propeller computer. In addition to the descriptive treatise on the computer, Messrs. Taylor & Carpenter have sent us an actual computer. The computer is composed of one stationary and two movable disks, carrying suitable scales, and constitutes an instrument designed for the purpose of furnishing means whereby the dimensions and proportions of screw propellers—diameter, pitch, surface revolutions, slip and efficiency—can be quickly and accurately determined for any given case or set of conditions. The formulæ which form the basis of its design and construction were deduced by the author from a rigid analysis of the results furnished by the experiments of Mr. R. E. Froude for the British Admiralty. The computer is substituted for the cumbersome and tedious methods of application of Mr. Froude's results. The use of the computer will enable the designer to arrive at a solution of propeller problems in a small fraction of the time previously taken, the results being practically identical with those obtained with the use of Froude's formulæ.

GEOMETRICAL SOLUTION OF ALGEBRAICAL PROBLEMS APPLIED TO ARITHMETIC. By A. W. Fernando, Inventor of the Sliding Decimal Scale. Part I. Colombo. 1902. Pp. 23. 16mo.

THE MODERN CORPORATION. By Thomas Conyngton. New York: The Ronald Press. 1902. Pp. 88. Price 50 cents.

Coming as it does from a lawyer, this little book deals with the corporation largely from the legal standpoint. There is probably no other book which presents so concisely the elementary facts upon which corporate law and procedure are based. The author has endeavored to present the objects, method, defects and advantages of the corporate form tersely and yet accurately.

THE PRACTICAL ENGINEER. Electrical Pocket-Book and Diary 1903. Manchester, England: Technical Publishing Company, Limited. Pp. 339.

THE PRACTICAL ENGINEER POCKET-BOOK, 1903. Manchester: Technical Publishing Company, Limited. 1903. Pp. 568.

These two handbooks for engineers and electricians contain the usual information to be found in pocket-books. Although the list of engineering pocket-books is already large, there is no doubt room for two more, particularly for two which present their information concisely and authoritatively.

ISOLIERMATERIALIEN UND WÄRME (KÄLTE-) SCHUTZMASSEN. Von Eduard Feltone. Leipzig, Vienna and Budapest: A. Hartleben. 1902. Pp. 330.

Heat insulation has developed to such an extent in the past twenty-five years that the industry of providing insulating materials has grown to be of no little importance. For that reason Mr. Feltone's book should prove of exceptional value. The few data which are to be found scattered in the literature of heat have been collected by him, completed and expanded. Many errors are corrected. Brief descriptions of raw materials, such as asbestos, rubber, gutta percha and the like, present much information that is new. Not the least instructive portion of the book is the section devoted to electrical insulators.

THE MODERN WOOD FINISHER. By F. Maire. Chicago: Press of the Western Painter. 1901. 12mo. Pp. 176. Price 50 cents.

While it is not claimed that the practical, first-class wood finisher will receive much addition to his store of knowledge by reading this volume, yet the great majority of painters and contractors who have not made that branch of the trade a specialty, will welcome it and will find it of interest.

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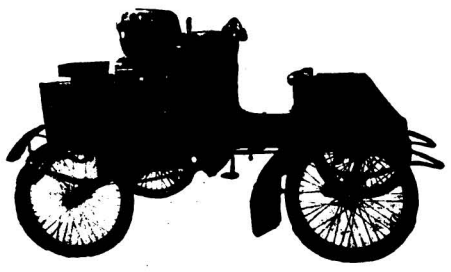

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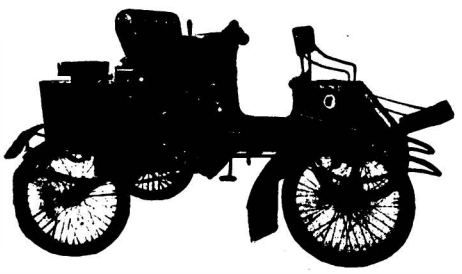

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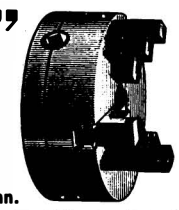

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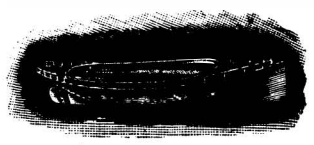

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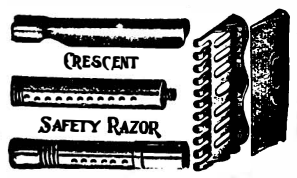

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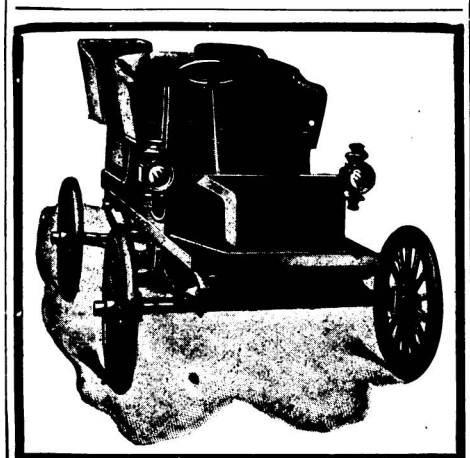

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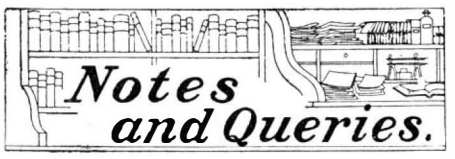

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(8798) C. H. H. says: I wish to use my gasoline car during cold weather. Kindly tell me whether chloride of lime, added to the water used to absorb heat from the cylinders, will prevent the water from freezing when the machine is not in use, and the water is cold. What proportion of chloride of calcium should I use? What weight per gallon of water? A. Chloride of calcium (not chloride of lime) can be used to lower the freezing point of water. All dissolved salts tend to corrode metal more quickly than pure water, hence care should be taken to clean up occasionally so as to prevent corrosion.

(8799) W. H. A. asks: 1. Does the process of steaming wood in any manner destroy the life of wood, and are there any limits to this destruction? A. The steaming of wood for bending purposes seems to do no injury, as the lasting quality of wood so treated is very evident in our old ships and bent wood in agricultural implements. 2. In small-boat construction is there any special process for steaming wood (pine or oak)? A. The universal practice is simply a wooden steam box connected to a closed kettle of water over a fire. 3. If there is a destruction of the vitality of woods, would there be a way of lessening this effect? A. Even the steam boxes in use for many years retain vitality and strength in the wood to a surprising extent. We know of no needed improvement.

(8800) H. E. H. wishes the exact number of pounds (16 ounces) a cubic foot of hydrogen gas will raise. A. One thousand cubic feet of hydrogen weighs 75 pounds less than 1,000 cubic feet of air at normal pressure and at the freezing point of water. It is customary to allow 70 pounds as the lifting power of 1,000 feet of hydrogen in a balloon, the difference being to provide for some advantage on the part of the hydrogen. It would balance 75 pounds, but lift 70 pounds with ease.

(8801) A. L. writes: In query 8701, regarding the farmer plowing a field, you state that the problem is not an arithmetical problem, but requires a solution in algebra. Please explain why it is not an arithmetical problem, and why the following arithmetical solution is not correct. In the problem there are given two parts to find the whole, namely, the dimension of one part and the ratio of the other part to the whole. The ratio of the unplowed square to the field is given as ¾ of the field. The question to solve there is: What is the ratio of the unplowed side to the whole side? A ratio is simply a multiplier. An arithmetical rule is: Multiplying or dividing the side of a square, or the diameter of a circle, multiplies or divides the area by the square of that multiplier or divisor. ¾ in the problem before us is a multiplier of an area, viz., the area of the field. By the above rule ¾ must equal the square of the multiplier of the side. The square root of ¾ is 0.866, which equals the ratio of the unplowed side to the whole side. 0.866 + the 20-rod strip = the whole side. Therefore the side being unit or 1, 1 — 0.866 = 0.134, or 20 rods. If 20 rods are 0.134 of the side, the side will equal 20 rods ÷ 0.134 = 149.2 rods, and the unplowed side will be 0.866 times 149.2 = 129.2 rods. As 160 square rods make one acre, by the simple process of multiplication and division the number of acres can be readily found. A. The solution given above is an ingenious arithmetical solution for the problem referred to, which did not occur to us when we solved it. But we still submit that such problems may be more easily and elegantly solved by algebraic methods, and by such methods are usually solved. The arithmetical method is to work from the conditions of the problem to determine the answer. The algebraic method is to assume a letter to represent the answer, and to work with the answer thus assumed according to the data till an expression is found for the answer in terms of the numbers or letters given as data in the problem. The two methods are thus seen to be diametrically the opposite of each other. We think most mathematicians more frequently employ the algebraic method, though we are sure that those who habitually use the arithmetical method consider it preferable to the algebraic.

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A wonderful new book entitled, "The Secret of Power," has just been issued, at an expense of over $5,000, by one of the leading colleges of the City of New York. This book is from the pen of the ablest specialists of modern times. The authors gave away the copyright on condition that 10,000 copies should be distributed to the public free of charge. The Columbia Scientific Academy is now complying with this contract, and until the edition of 10,000 copies is exhausted you can get a copy of this book absolutely free. The book is profusely illustrated with the most expensive half-tone engravings. It is full of wonderful secrets and startling surprises, and thoroughly explains the real source of the power of personal influence. It fully and completely reveals the fundamental principles of success and influence in every walk of life. The hidden mysteries of personal magnetism, will-power and scientific character reading are explained in an intensely interesting manner. Two secret methods of personal influence are described, which positively enable any intelligent person to exercise a marvellous influence and control over any one whom he may wish. These methods are entirely new and have never before been made public. A reporter has tried them personally and can vouch for their wonderful power.

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Not long ago John D. Rockefeller, the richest man in America, said, in talking to a Sunday school class, that he attributed his success in life largely to his ability to influence others. Lincoln, Lee, Napoleon and Alexander the Great all won fame and renown by their wonderful powers of personal influence. Jay Gould piled up millions by this same power. J. P. Morgan organized the billion dollar steel trust and enriched himself by millions simply by his marvellous ability to influence others. There are to-day thousands of men with the brains and education of Mr. Morgan who are practically paupers. They have the ability to organize a trust, but they have not sufficient power of personal influence. Personal influence, will power, stamina—call it what you will—has from the creation of man been the subtle force that has brought wealth, fame and renown to those who are fortunate enough to possess it. This strange, mysterious influence is inherent in every human being. By the late methods explained by the New York specialist in human culture any intelligent person can develop a wonderfully magnetic personality, and learn how to read the character, secrets and lives of others in a few days' study at his own home. You can use this marvellous power without the knowledge of your most intimate friends and associates. You can use it to obtain lucrative employment, to secure an advance in salary, to win the friendship and influence of others, to obtain a greater share of happiness from life. You can be respected, honored and become a leader in your community.

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Mrs. C. Richmond Duxbury, of 472-A Greene Ave., Brooklyn, N. Y., the authoress of "New England Folk," recently sent for copies of the books; after carefully examining them and testing the methods of personal influence on her friends and associates, she makes the following statement in a letter to a friend: "Nothing could induce me to part with the advantage that my little knowledge of your books has given me. Any student can acquire it and will be fascinated and delighted with the result."

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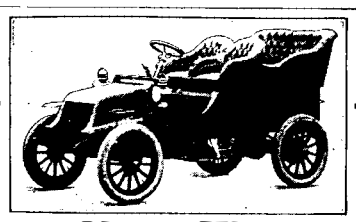

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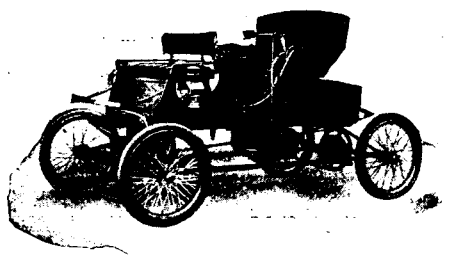

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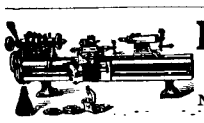

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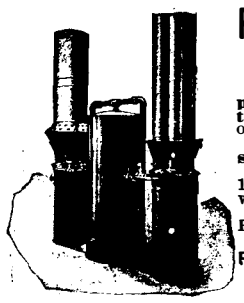

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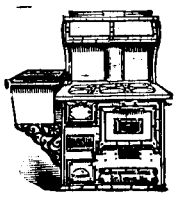

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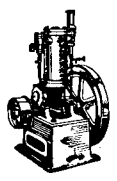

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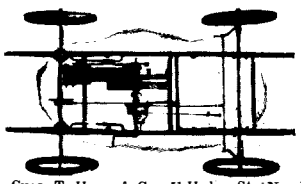

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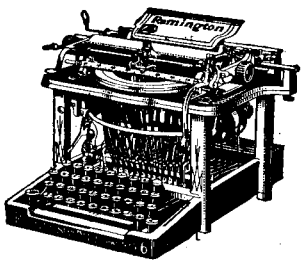

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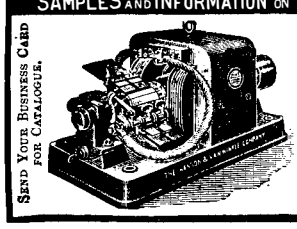

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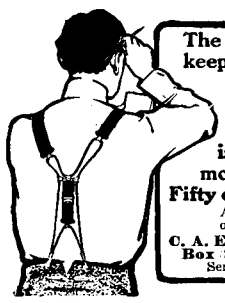

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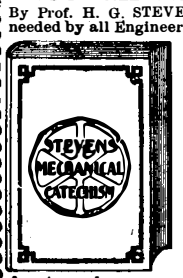

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